GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

(Founded in 1849 as the "Journal of Gas Lighting.")

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Editorial Notes.

A Very Healthy Catalyst.

NOT so very long ago, in Widnes coal was an asset to the gas undertaking—in other words, "residuals" brought in, per ton of coal, more than the cost of that coal. Those were happy days; competition was not so exceedingly keen. To-day, however, as everybody knows, there is more than a little competition in the market for gas-works residuals, chief among which is coke. As a result the consumer is bound to benefit, not before time. He expects nowadays good coke properly delivered, and it is up to the gas industry to supply this demand. Of course, it is not easy, but the outstanding fact remains that there is a demand far greater than ever before, and the conditions of this demand have only to be fulfilled for the industry to effect a volume sale of coke greatly in advance of anything previously anticipated.

One of the conditions—it is only one—is the manufacture of a suitable domestic fuel, and this cannot be met without adequate research and works testing. Hence we welcome the Presidential Address of Mr. W. J. Smith, of Bolton, before the Manchester Institution of Gas Engineers and Managers, in which he lays such stress on the value of experimental work on a full-scale basis. The virtue of the Bolton test plant must be evident to all, but there is one phrase in Mr. Smith's reference to which we desire to call specific attention: "Our work up to the "present has shown us that the production of useful cokes "does not need to interfere with the efficiency of gas "manufacture. In many cases we have noticed that big "improvements in this direction take place simultaneously "with an improvement in coke."

The fact that the Bolton undertaking do a large amount of research off their own bat makes them more appreciative than would otherwise be the case of the research work of others. This is inevitable, and it makes for progress; research like this, we suggest, acts as yeast in the dough of general management—it is a catalyst which energizes all departments into that little added activity which is such an efficient lubricant to the wheels of future improvement. Mr. Smith speaks of his test plant as an ambitious one. The adjective used is a just one; it is essential to have schemes which are ambitious, and we are tired of that type of undertaking which itself is not tired of current practice. If our industry as a whole paid a little more attention to the word ambition, and less to the word safety, it would be very much safer. The "going on nicely" idea is absolutely fatal.

There is one further observation which we should like to make on Mr. Smith's excellent contribution, which is such an admirable vindication of vertical retorting, and that is the great value of his figures of the costs of extensions to the Bolton works. Full details of a complete gas-making plant are listed, from which it will be observed that the carbonizing plant itself accounts for less than 37 p.ct. of the total cost.

Statutory Minimum Coal Prices.

LAST week we were able to record with satisfaction the deletion from the Coal Mines Bill of one of its most vicious proposals—a compulsory national levy on coal for inland consumption in order to provide a subsidy for exports. Hopes that further blemishes might be removed have now been dashed by an amazing example of one of the political parties apparently sacrificing convictions for something else not yet clearly revealed. We do not discuss politics, but the upshot of the Liberal *volte face* in the last Committee stages of the Bill is that the District Committees of coalowners are, after all, to have the power to fix minimum prices below which each class of coal may not be sold, and to collect a district levy for the purpose of facilitating the sale of any particular class of coal.

With the minimum price provision remaining, the supporters of the Bill would seem to have every reason for satisfaction, even without the national levy. The Committees can discriminate against any class of coal they choose, and unfortunately for our industry export gas coal can be placed in a different class from inland gas coal. In fact, the President of the Board of Trade, in defending the clause, quite frankly admitted it was beyond dispute that there would be a higher price for certain classes of home demand. If the sale of coal at a loss cannot be avoided, he said, it is idle to proceed with the Bill at all. The crux of the situation, as we see it, is that a minimum price may be fixed even for export which will prevent one colliery undercutting another, but it must be a price which will bring orders in open competition with other countries. If it has to be an unremunerative price, then the home consumer must make up the difference, so that the total sales are not at a loss to the collieries. Unfortunately with the reduction in hours which the Bill also provides, and the quota system which implies short-time working, it seems out of the question that production costs will not soar, and this raises a distinctly gloomy prospect for public utility undertakings, which, there is reason to believe, are regarded as the most "squeezable" of home consumers.

The district levy which has been left in the Bill appears to differ little, except in degree, from the national levy which has been expunged. But it is a voluntary or permissive arangement for each district to accept or reject, and will not provide a general pool from which one district can be subsidized at the expense of another. The difficulty we foresee here is that a district which does not favour the principle, such, for instance, as Durham, in

which our industry is so interested, may be forced into it in competition with another, such as Yorkshire, which already subsidizes its exports by a levy on inland sales. In any case, with minimum charges statutorily enforceable upon all coal producers, there seems to be ample provision for making the home consumer foot the bill of export losses, whatever internal arrangements the owners may make for compensating their weaker members.

The Liberal Party have hinted at the possibility of amendments in the Report Stage of the Bill. Unless they can and will do something, the prospect of dearer coal is assured for the gas industry, and none of the evils which have been stressed ever since the publication of the Bill will have been eliminated. The crisis which the miners threatened if it was dropped may have been averted, though it could almost certainly have been averted in any case. The disaster which coalowners representing 75 p.ct. of the export trade are threatening if the Bill passes has still to be faced, and this we think is a much more genuine menace. The probability that the entire complicated bureaucracy will prove unworkable is poor consolation, because the disorganization entailed by attempting to put it into practice would in itself be a calamity which the country can ill afford.

Put to the Test—

And not found wanting. Two nights ago we witnessed a highly interesting and encouraging street lighting demonstration in South London. The installation is on the main road to Hastings—a two-mile stretch running along Lewisham High Street from South Catford to Loampit Vale. One mile is illuminated by gas, and the adjacent one by electricity. Both systems are thoroughly modern, and the conditions of this large-scale trial are exactly similar; the cost of the installation and maintenance of the two systems, we are informed, is approximately the same, so that the decision as to which illuminant is to be adopted will depend on a careful comparison of expert opinion as to which gives the better results. The scheme is an arrangement between the Lewisham Borough Council and the South Metropolitan Gas Company and the South Metropolitan Electric Light and Power Company, and it was undertaken as a result of protests sent to the Council on account of the number of accidents that have occurred.

We only wish that gas had invariably to encounter such fair conditions of trial, and that all authorities were so enlightened as in this instance. As we remarked in these columns a few weeks ago, all too frequently, a change-over from gas to electricity is accompanied by a more generous scheme, so that it is most unjust to compare the new installation with the old. Here, however, we have a true comparison; and the consensus of opinion at the demonstration favoured gas. Among many motorists present was Captain Malcolm Campbell, the racing motorist, who stated that he felt the electric lights were not set out to the best advantage and, in his opinion, would probably have been more suitable for pedestrians and motorists alike if the principle of overhead illumination had been adopted. Gas lighting, he said, would doubtless prove to be more reliable, and was certainly more penetrating in foggy weather.

To use a stock expression, "given a fair field and no favour," gas can more than hold its own as an outdoor illuminant. The power of penetration in this instance is remarkable, and the admirable diffusion and absence of glare must appeal to all motorists, just as the reliability of gas must appeal to lighting authorities. The gas lamps, which are supplied with gas at a pressure of 3 lbs. per sq. in., are centrally suspended at a spacing of 50 yards; no reflectors are used, and the illumination, free from all interspace dark patches, and carrying to the buildings on both sides of the street, provides the motorist with a clear view of the traffic on the highway and the pedestrians on the pavement. The electric lamps are placed alternately on opposite sides of the street at a height of 18 ft., each lamp being fitted with a reflector which directs the light towards the centre of the road. Both are good installations, but we think that the unbiased will agree with our opinion that gas wins. The mile stretch of gas lighting is a splendid example of what gas can do, and provides ample refutation of any idea that gas is not well suited to the traffic needs of the times and of the future.

As Others See Us.

As recently as last week, there were reproduced in the "Journal" some photographs and details descriptive of the extent to which gas is being used in the modern home for heating, cooking, and hot water supply. There were featured different types of dwellings on private and public housing estates; and the message that was conveyed was one of extraordinary encouragement to those engaged on the distribution side of the gas industry. Both pictures and facts were taken from a publication which, as was mentioned at the time, neither salesman nor manager can afford to neglect—that is, the British Commercial Gas Association's "A Thousand-and-One Uses for Gas." This is publicity which possesses distinctly informative value both for those within the industry and for those without; and it is the very best kind of publicity, because it focuses attention upon actual accomplishment. What has been done on the estates cited may be done elsewhere; and this is why the effort of the "B.C.G.A." is so well worth while. It is to be presumed that, in addition to literature of this character finding a place in the gas showroom, care is taken to sow it upon "good soil" outside. The gas industry is fortunate in its publicity work, and it should miss no opportunity of taking advantage of it. Perhaps the industry does not always realize to the full the strength of the weapon that has been fashioned for its use; but if unhappily that should be the case, others, at any rate, are fully alive to the situation.

Admiration of the organization and work of the "B.C.G.A." has on occasion been expressed by our friends the electricians, who are in a position to estimate accurately the value of the Association's services to our great industry; and a few days ago there was afforded from another quarter equally striking testimony in favour of gas publicity and service. Mr. Herbert Morrison, Minister of Transport, as the principal guest, was called upon to make a speech at the annual luncheon of the British Electrical Development Association, and this he began by remarking that it is now recognized that advertising is one of the essentials of modern industry. We would add that this fact should be recognized even more generally than it is. There are some things which business people can afford to do without; but advertising is not one of them. However, let us return to Mr. Morrison, to whose testimony in favour of the publicity work of the gas industry it is desired to call attention. Just what he had to say upon the subject is reported by "The Times" as follows; the first sentence being applicable equally to gas as to electricity: "It was the duty of supply undertakings to see that they were adequately equipped with a sales organization which not merely preached the virtues of electricity but was a service organization ready to take the consumer by the hand and give him the best advice and assistance in the economical and effective use of electrical energy. The industry should learn from the publicity campaigns conducted by other branches of commerce, particularly from the first-class publicity and service activities of the great gas industry, for whose energy and push he had the warmest admiration."

We would earnestly commend to readers this testimony by Mr. Morrison. It is no light thing to have earned; but it is well deserved. And this brings us again to the opening lines of our article. Mr. Morrison went on to urge the electrical industry not to be content with the lighting load only, but to "push the use of this wonderful energy for cooking, heating hot water, cleaning, and so

"on." This is a push which the gas industry must withstand; and the issue of "A Thousand-and-One Uses for Gas" showing the extent to which gas is being employed on public and private housing estates will help it to do so.

Oxide Purification.

The working simplicity of oxide purification is at once its justification and its disadvantage. It is so easy to say that the cost of the process is next to nothing, and to forget the large amount of capital entailed not only in the installation of the plant itself, but in the value of the space occupied by the boxes and the revivification area; moreover, in view of possible extensions to carbonizing plant, it may be difficult to assess the value of the potential space. There can be no doubt that attention to improved methods of working is amply repaid by reduced costs and also by postponement of the capital expenditure on new boxes.

In a contribution on the subject published in the "Journal" to-day, Mr. S. K. Hawthorn, of the Birmingham Gas Department, shows how improved methods of operation and careful selection of oxide, together with concentration on details and systematic organization, have effected savings of thousands of pounds a year on a large works. The contribution is an abstract of a thesis which gained for the author the coveted Diploma of the Institution of Gas Engineers; it is an excellent piece of work, fully deserving of close study. Speaking generally, not nearly enough consideration is given to the selection of oxide. Working costs are often set aside too lightly when the initial cost of the purifying material is under discussion. There is a tendency to lay too much stress on first cost of the oxide, which has little bearing on the costs of the process as a whole. Initial price ought certainly to be a secondary affair; if proof be needed of this, it is supplied by Mr. Hawthorn.

The author explains how the use of a specially prepared oxide, and efficient routine organization, result in an increase of at least 30 p.ct. in the capacity of the plant, in reduced working costs, in simpler and cheaper internal equipment of boxes, in lower steam consumption by exhausters, and in elimination of naphthalene troubles. Hence, as corollaries to this, he states that orthodox purification with natural oxide is not the cheapest method, and that the usual rules for determining the maximum capacity of purifiers do not apply to all types of oxide. Logically he recommends that there is need for further research on prepared oxides, with which we heartily agree; and we call particular attention to his interesting suggestion that the possibility of the commercial success of a number of plants in selected centres for the extraction of sulphur and cyanide from spent oxide, with the return of the prepared oxides to the gas-works, requires consideration on a national basis.

Finger-Posts.

A glance at the notices of Applications for Special Orders under the Gas Undertakings Acts, 1920 and 1929, which are referred to on later pages of this number of the "Journal," will give further proof of the trend of policy in the gas industry to-day. These notices foreshadow further amalgamations, by which seven undertakings will become three. The Bath Gas Company have a scheme on hand to acquire the undertakings of the Chippenham Gas Company and the Corsham Gas Company. The Watford and St. Albans Gas Company are proposing to take over the Elstree and Boreham Wood Gas Company. Then there is the Yorktown (Camberley) and District Gas and Electricity Company, who are asking for an Order to provide for the transfer to them of the undertaking of the Henley-on-Thames Gas Company.

Gas Fire Ventilation.

On later pages to-day will be found an important contribution on the subject by Mr. W. J. G. Davey, B.Sc., Chief Chemist to the Birkenhead Corporation Gas Department. The work he describes was carried out when he was at Southport, following upon suggestions made by Mr. John Bond, O.B.E., the Engineer and Manager, who has always taken such a keen interest in the subject. The author adduces a formula for calculating the size of flue needed for a fire, given the gas consumption of the fire and the height of the flue or chimney. The contribution includes a nomogram prepared so that the ventilation may be determined without calculation, given the minimum flue area of the fire, the rate of gas consumption, and the height of the chimney. "In this scientific age, we should be able to determine the heating and ventilating effects of gas fires for any conditions, and we should strive to educate our salesmen and fitters in these matters, so that gas fires, the clean and efficient method of heating, may be supplied on scientific lines. The heating effects of gas fires have been exhaustively studied; the ventilating effects with which the former are closely connected have not received the attention that perhaps they should." We think the publishing of these tests and results will stimulate further interest in this important matter.

Dry Gas for Small Undertakings.

That dehydration as a successful process is not in any way limited to large works is obvious from an article by Mr. E. Porteous, Engineer and Manager to the Ware Gas Company, in later columns. He gives his experience of a Holmes "Dri-Gas" plant specially adapted for small undertakings. The results are admirable, says Mr. Porteous. "I had regarded the process as something desirable, but rather in the nature of a luxury—particularly for a small works. My view now is that it is more than a refinement—it is a necessity, and quite as important a unit as the scrubbers or the purifiers." We call attention to the charts which accompany the article. They are pressure records "before and after" installation of the plant. During the winter of 1928-29, the Company were troubled by oscillations of pressure at times of peak load, due to a pocket of water in the trunk main near the works. Within a week from starting the plant, the oscillation ceased, and the pressure-line is now steady. The charts refer to Feb. 18, 1929, and Feb. 10, 1930; and, in spite of a considerably larger send out of gas on the latter day, the pressure at times of peak load shows a remarkable improvement.

Setting a Bad Example.

In recent weeks reports have been appearing in the "Journal" of the working results of gas companies during last year. The statistics have been gratifying; but our perusal of the facts has revealed one incident which has been a surprise after all the time and effort that has been expended upon urging the industry to fight for the lighting. At one Gas Company's meeting, a shareholder, in the course of some remarks, said "one of the things which had struck him was the fact that in their present offices at the works they had fitted up electric light. Was that an indication that they could not rely upon their own gas? Why did they not use gas for lighting purposes?" The reply given to this question was to the effect that there were three offices where men were working, and it was felt that the electric light would be better than gas. It was added that the showroom would be lit with gas. Evidently the old saying that "what is sauce for the goose is sauce for the gander" does not apply here. When decisions like that referred to are taken within the industry itself, it is small wonder that outsiders, who perchance have had no opportunity of acquainting themselves with the full facts, should make loose assertions. Who can help those who will not help themselves—and not only who will not help themselves but who make the task of other workers so very much harder? The outsider may plead ignorance; but for the insider that should not constitute a valid excuse for any action that is not in the best interests of the industry he serves.

"Daily Mail" Ideal Home Exhibition.

The "Daily Mail" Ideal Home Exhibition, which was formally opened on Monday of this week, is on a very much larger and more lavish scale than even the best of its many predecessors. The inclusion of the new Empire Hall has added

no less than two acres of extra floor space. This not only makes the Exhibition the largest ever held, but has permitted the enlargement of certain important sections, the addition of many new features, and the provision of wide gangways and convenient open spaces, so that visitors may see the whole Exhibition under the most perfect conditions. The London Gas Exhibit is, as usual, a striking one, illustrating the large, and essential, part which is played by gas in the ideal home.

"B.C.G.A." Fairy Gas Competition.

The Annual Competition for school children organized by the British Commercial Gas Association opens this year on April 25, and gas managers who take an interest in it are urged to bring the question of the awarding of local prizes before their Committee at an early date. The Executive hope that the majority of undertakings will supplement the national prizes by local prizes, so that even if the best children in any locality do not reach the standard of national prizes, there will be a strong incentive to enter the Competition in the hope of being one of the best in the locality. We are informed, however, that the "B.C.G.A." cannot undertake to judge entries for local prizes unless they are advised before the closing date of the Competition, June 16. Full particulars of national prizes and scholarships will be furnished to members of the Association about the end of this month.

Personal.

One of the highest of Papal decorations has been awarded to Mr. J. H. Canning, O.B.E., Engineer and Manager of the Newport Gas Company, who has been made a Knight of the Order of St. Gregory for his services generally, and especially for his services in connection with the Beatification of English and Welsh Martyrs. The Order was founded in 1831 by Gregory XVI., and the decoration is for "Civil or military virtues in the Vatican States." A special solid gold medal has been struck in the Vatican Mint to celebrate the occasion of the Beatification of Martyrs, and this, also, has been presented to Mr. Canning. Only 24 of these were struck.

Mr. A. Cook, Engineer and Manager of the Warrington Corporation Gas Department, has been elected a member of the Council of the Warrington Rotary Club. He has been an active Rotarian for some time.

Mr. F. N. Howes, the Deputy Gas Engineer to the Burnley Corporation, having resigned on his appointment as Engineer and Manager to the Chelmsford Gas Undertaking, the Burnley Corporation has deferred for six months the question of the appointment of a successor, and before the expiration of that time the gas engineer is to submit a report upon the re-organization of the administration of the Department consequent upon the purchase of a supply of coke oven gas.

At the Annual Meeting of the Institute of Arbitrators on March 18, Mr. J. R. Willis Alexander, Secretary of the Institution of Gas Engineers, was elected a Member of Council.

Mr. F. C. Tilley, Managing Director of Messrs. Tilley Brothers, Ltd., is away from business owing to illness. We are glad to say, however, that he is progressing favourably, and no doubt this information will be of interest to his many friends in the gas industry.

At the annual concert of the Newcastle and Gateshead Gas Company's employees held in the Company's premises, Newcastle, Mr. A. Inness and Mr. W. Renwick were presented with gold watches to mark their completion of 50 years' service with the Company.

Obituary.

The death is announced of Mr. S. G. Tulk, of Aylestone Hill, Hereford, formerly of Builth Wells, where he was 32 years in business. When he went to Builth Wells he took over the management of the Gas-Works, and soon became the chief shareholder in the Company. Owing to the fact that he desired to retire the works were sold a few years ago to the present Company.

After a long and painful illness, the death took place on March 4 of Mr. F. W. Beech, Manager of the Selsey Works of the Petersfield and Selsey Gas Company. He was interred at Church Norton, Selsey, on March 10, amid expressions of sympathy with the widow and relatives of the deceased, who was practically a young man. He was highly regarded by all those connected with the Company, and they have lost a valuable servant.

Forthcoming Engagements.

[Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.]

March 28.—Southern Association of Gas Engineers and Managers.—Annual General Meeting at the Hotel Cecil, Strand, W.C. 2, 2.15 p.m.

April 2.—London and Southern District Junior Gas Association.—Visit to the Works of the Bromford Tube Company, Birmingham.

April 3.—Midland Junior Gas Association.—Visit to the Works of Messrs. Latch & Batchelor, Ltd., Birmingham.

April 5.—Scottish Junior Gas Association (Eastern District).—Meeting and visit to the Corporation Gas-Works, Perth.

April 5.—Manchester and District Junior Gas Association.—Annual Dinner. Paper by Mr. H. P. Lupton, B.Sc., A.I.C., on "Domestic Fuel by High-Temperature Carbonization."

April 10.—Society of British Gas Industries—Council Meeting.

April 11.—North British Association of Gas Managers.—Spring meeting at Helensburgh.

April 12.—Yorkshire Junior Gas Association.—Visit to Messrs. Low-Temperature Carbonisation, Ltd., Askern Main Works, Doncaster.

April 17.—Midland Junior Gas Association.—Meeting in the Council House, Birmingham. Paper by Mr. J. H. Willis, A.M.I.Mech.E., of the Waterless Gasholder Company, on "Waterless Gasholders."

April 26.—Western Junior Gas Association.—President's Day. Visit to the Weston-super-Mare Gas-Works, and Annual Meeting.

April 28.—Wales and Monmouthshire Junior Gas Association.—Annual General Meeting at Newport.

May 2.—North of England Gas Managers' Association.—Annual General Meeting in Newcastle.

May 16.—Society of British Gas Industries.—Annual General Meeting and Dinner, Hotel Metropole, London.

May 27.—National Gas Council.—Annual meeting.

June 2-5.—Institution of Gas Engineers.—Annual Conference in Leeds.

John A. H. Hunt has been registered as a Company, with a nominal capital of £10,000, to carry on a business of manufacturers of gas and electrical fittings. Directors: J. C. B. Hunt and F. S. Banks, 233, Bradford Street, Birmingham.

Tenders for Godalming Share Issue.—The tenders for the 500 £10 new ordinary shares which were offered by Messrs. A. & W. Richards, of 37, Walbrook, E.C. 4, on behalf of the Directors of the Godalming Gas and Coke Company, were opened on March 21, the issue being largely over-subscribed at prices ranging from £11 per share down to the minimum of par.

Gibbons (Dudley) Ltd. Report.—The Directors of Messrs. Gibbons (Dudley) Ltd. submit the balance-sheet, showing the position of the Company on Dec. 31, 1929. The net profit for the year, after providing for depreciation, is £12,878, which, added to the amount brought forward from last year, £9645, makes a total of £22,523. From this amount the following dividends have already been paid: The full 7 p.ct. preference dividend, free of income-tax, for the year and the interim dividend on the ordinary shares of 5 p.ct., *less* income-tax, leaving a balance of £7449. The Directors recommend the following allocation of the balance: To pay a final dividend on the ordinary shares of 3½ p.ct., *less* income-tax, making, with the interim dividend already paid, 8½ p.ct. for the year, *less* income-tax, and further Directors' fees amounting to £675, which will leave a balance to carry forward to next year of £10,653.

Inquest on Padiham Works Fatality.—An inquest was held last Wednesday at Padiham on Henry Fifield (52), works foreman at the Padiham gas-works, who was found dead in the engine house. With a labourer he went to make a new joint in a pipe that was leaking in the retort house. This pipe conveyed gas from the retort to the purifiers, and they were actually engaged on repairs for 15 minutes. After the completion of the work Fifield complained of feeling queer, but went down an iron vertical ladder on to a landing and later to the place which he used as an office. He was later found on his back by a pupil engineer, and was then dead. The labourer said that while they were replacing an asbestos ring gas was leaking. He was not affected, and Fifield also seemed all right after he had gone outside the retort house. Fifield had been a gasworker for 27 years, and came from Great Harwood three years ago. The jury returned a verdict of "Accidental death," and found that the man's death was accelerated by his having inhaled a quantity of gas. They recommended that it should be compulsory for gas masks, &c., to be kept at the works.

In To-Day's "Journal."

New Books.

Among the new books reviewed in the "JOURNAL" to-day is "The Principles and Practice of the Assessment of Gas Undertakings for Imperial and Local Taxation," by H. T. Seymour; published at the "JOURNAL" Offices by Walter King, Ltd.

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Opening of New Plant at Bingley.

March 21 last saw the official opening of a new installation of vertical retorts for the Bingley Urban District Council, supplied and erected by Messrs. Drakes, Ltd., of Halifax. The installation, complete with offices, has cost £34,000, and is guaranteed to give a nominal yield of 1,000,000 c.ft. per day of a calorific value of 500 B.Th.U. The vertical retort stack consists of 16 retorts, built in four settings of four and arranged in units of two, each retort having a nominal coal throughput of four tons per diem.

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A Diploma Thesis.

An abstract is published of a thesis on oxide purification which won for its author, Mr. S. K. Hawthorn, of the Birmingham Gas Department, the Diploma of the Institution of Gas Engineers. He explains the economies to be gained by the use of a specially prepared oxide and by efficient routine organization. He says that orthodox purification with natural oxide is not the cheapest method; that the usual rules for determining the maximum capacity of purifiers do not apply to all types of oxide; and that naphthalene troubles may be aggravated or alleviated by the method of working the purifiers. He recommends further research on prepared oxides.

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Research Work at Bolton.

The Bolton Gas Department have a test plant consisting of condensing, exhausting, washing, scrubbing, and purifying plant capable of dealing with about 300,000 c.ft. of gas per day. An outline of some of the work carried out in it is given by Mr. W. J. Smith, B.Sc., in his Presidential Address to the Manchester Institution of Gas Engineers and Managers. "Our work up to the present," he says, "has shown us that the production of useful cokes does not need to interfere with the efficiency of gas manufacture. In many cases we have noticed that big improvements in this direction take place simultaneously with an improvement in coke."

Gas Fire Ventilation.

An important contribution on this subject, by Mr. W. J. G. Davey, B.Sc., Chief Chemist to the Birkenhead Corporation Gas Department, is published. The author gives a nomogram so that the ventilation may be determined without calculation, given the minimum flue area of the fire, the rate of gas consumption, and the height of the chimney.

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Gas Dehydration for Small Works.

Mr. F. Porteous, Engineer and Manager to the Ware Gas Company, describes in an article to-day a successful gas dehydration plant which embodies special adaptations for small outputs. Altogether, says Mr. Porteous, the process is a sound economic one, and the plant requires little attention. The plant in question is similar in principle to other Holmes "Dri-Gas" plants, and has been already fully justified by the results, though it has been in operation only five months.

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Gas Lighting to Obviate Downdraughts.

Discomfort has been experienced in the Doncaster Corn Exchange due to its generally low temperature, and more particularly to the cold and unpleasant draughts from the roof. Mr. Robert Watson, Engineer and General Manager to the Doncaster Corporation Gas Department, explains how these troubles have been overcome by the fixing of six clusters of gas burners, which, in addition to their high illuminating duty, warm the surrounding air and prevent the downward flow.

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New Showrooms for the Croydon Company.

The Croydon Gas Company have a reputation for attractive showrooms, and the latest addition, at Wallington, to their list of premises fully carries on the traditions of its predecessors. With an external design of a Spanish character, and finished in white plastered walls with restrained carving to the window surrounds, the premises occupy a commanding position on a corner site, and enhance the architectural standard of the district. Behind the showrooms are roomy and up-to-date stores. The premises were opened on Monday, March 17, by Mr. A. E. Bennetts, J.P., Chairman of the Beddington and Wallington Urban District Council; and an account of the ceremony is published.

The Principles and Practice of the Assessment of Gas Undertakings for Imperial and Local Taxation.*

Reviewed by J. R. WILLIS ALEXANDER, M.A., LL.B.

The author of this admirable handbook substantiates his claim that it is concise, in everything but the title, the length and imposing nature of which might reasonably be expected to deter the very persons for whom the work is intended—namely, students and the officials of smaller gas undertakings. Moreover, the use of the words "Imperial and Local Taxation" is not as accurately informative as less pretentious words would be. We think imperially (especially of late), nationally, and locally; and to talk of "Imperial and Local Taxation," strictly correct though that description may be, creates the impression in the minds of the uninitiated that something different is intended from income-tax and rating, to which the book is in fact devoted.

Wherever Englishmen are gathered together, the conversation can usually be expected to turn towards the weather, the state of trade, or the burden of taxation. It is a little surprising, therefore, to find that the incidence of taxation is inadequately understood by the taxpayer, who either pays and complains or leaves the matter to his accountant. In the case of companies and individuals subject to substantial assessments, the engagement of an accountant is rendered essential by the inevitable complexity of an adequate and equitable system of income-tax, but whether settlement is vicarious or direct, all taxpayers in their own interests should have some knowledge of the subject. Mr. Seymour's book is written for gas undertakings by one actually within the industry, and it removes the excuse that there is not available in a simple, convenient, and readable form a work outlining the liability of gas undertakings to income-tax and rating.

* By H. T. Seymour, A.C.I.S., A.L.A.A., F.R.Econ.S. Published by Walter King, Ltd., 11, Bolt Court, Fleet Street, E.C. 4; 10s. 6d. net, post free.

THE PLAN OF THE WORK.

Approximately equal parts of the book are devoted to income-tax, local taxation, and appendices, the last affording a useful compendium of information and largely consisting of relevant extracts from Finance Acts, Statutory Rules and Orders, and Inland Revenue Agreements relative to gas undertakings. Not the least interesting chapters are those devoted to a review of the revenue and expenditure of the country and to a history of income-tax and rating. Some facts and figures are given as to the gas industry, but the author considers it "unnecessary to give a detailed historical account of the industry." One must agree that the subject-matter of the book does not necessitate such an account, but it must not be thought that it is unnecessary because the history of the industry is generally well known. Such is surely far from the truth. How many men could say in what year it was Van Helmont discovered that coal when heated "did belch forth a wild spirit or breath," when it was that Murdoch lit his house at Redruth with gas, where the vertical retort was invented, when gas cookers were first used, and when and where the Institution of Gas Engineers had its genesis?

If it is realized that the expenditure of local authorities (£500,000,000 per annum) approaches the amount raised (£693,421,000 in 1927-28) by the State in taxation generally, and that one third of the latter comes from income-tax, the necessity for the correct apportionment of income-tax and rates becomes apparent. Gas undertakings contribute about 0·4 p.ct. of the total amount of income-tax received by the Exchequer,

while 1·4 p.ct. of the total rates in England and Wales, and 2 p.ct. in Scotland, were levied in 1927-28 on gas undertakings. The cost of income-tax and rates is equal to an average of 2½d. or 3d. per 1000 c.ft. of gas sold by the undertakings, whose rating contributions in England and Wales (£2,464,000 in 1927-28) are slightly in excess of those of electricity undertakings and a trifle less than those collected from water undertakings.

In a short chapter giving interesting figures as to the gas industry from the Third Census of Production, 1924, the author refrains from discussing the advantages and disadvantages of company owned and municipally owned public utility undertakings. His views are not disclosed by his observation that local authorities do not supply the cheapest gas or electricity, although (and this will be challenged) they "generally pay higher wages than other industries (excepting the building trade) and higher salaries than those paid by companies in similar circumstances." Of 1438 gas undertakings in the United Kingdom, 636 are non-statutory companies, but their make of gas accounts for but 8750 million c.ft. per annum, out of a total make of 314,582 millions.

Income-Tax.

Additional duties on property and employment were imposed by Pitt in 1799, and other taxes succeeded them, but income-tax, as we know it to-day, dates from the Act of 1842, which remained in force until the Income-Tax Act of 1918 consolidated, with amendments, all the previous enactments. The amendments to the Act of 1918 which have taken place during the last twelve years, inevitably cause confusion, and a House of Commons Committee is considering a further Consolidation Bill. Mr. Seymour points out that "case law" must not be disregarded when considering the "statute law" as to income-tax, to which he might have added the official notices interpreting and giving effect to the law, which are sent by the Board of Inland Revenue to inspectors of taxes. These are not law, of course, but in the last resort the taxpayer's only alternative to compliance therewith is the Courts of Law. This course he hesitates to take, having in mind that, if the point at issue is of importance, the case will be taken by the Board to the House of Lords, and even if the taxpayer is successful there, he cannot ensure benefit for the future, because the next Finance Act could contain a clause re-establishing the attitude taken by the Inland Revenue. The system, however, is not an intolerable one in actual practice, since the truth is that no Department acts more equitably than the Board of Inland Revenue and their inspectors of taxes, having in mind the decision of the House of Lords that "a person who comes within the letter of the law must be taxed, however great the hardship may appear to be, as an equitable construction is not permissible in a taxing statute."

Having drawn attention to the abolition of the "average system" of assessment and the transfer of gas undertakings from Schedule A to Schedule D in 1927, thus effecting greater uniformity between the rules applicable to all trading concerns, the author proceeds to deal with the actual principles and practice of assessment in an attractive and readily understood manner. He prepares in detail a specimen revenue account of the "Blank Gas Company" and deals *seriatim* with the several items therein. The headings indicate that no aspect of importance to gas undertakings has been omitted. "Repairs, Maintenance, and Renewal of Plants and Mains," "Renewal of Meters, Stoves, and Fittings," "Cost of Dredging," "Interest on Hire-Purchase Payments," and "Payments to Co-Partners" are all special matters upon which gas undertakings seek guidance in making their income-tax computations. Since, however, the book is intended to indicate the "approach" to more voluminous authorities, it is a pity that the authorities for several statements, and particularly the references of the cases quoted, are not given more frequently and particularly, albeit at the expense of adding footnotes, which the author has largely avoided, presumably in the commendable interest of easy reading.

Needless to say, much attention is given to the admissibility of certain expenses as a deduction from the profits for the purpose of income-tax, and it is suggested that the principle was best enunciated in *Ownsworth* v. *Vickers*, when Rowlatt, J., said, "The real test is between expenditure which is made to meet the continuous demand for expenditure, as opposed to an expenditure which is made once for all. . . ." The attitude of the Board of Inland Revenue, under Section 33 of the Finance Act of 1926, in "insisting that any unexhausted wear and tear allowance, which has been brought forward from a preceding assessment, must be set off against the statutory loss of the particular year before the relief afforded by the Section becomes operative," is characterized by the author as being without statutory justification and contrary to the intention of the legislature. In dealing with the Scottish case of *Largo and Lundin Links Gas Company, Ltd.*, v. *Smith* (1922), attention is drawn to the principle that an appeal from a decision of the Commissioners of Inland Revenue must be on a point of law and not on a question of fact, upon which the Court cannot vary the finding of the Commissioners, which factor should be borne in mind when considering the desirability of stating a case for the Courts.

In an extremely useful chapter on the important subject of "Depreciation, Wear and Tear Allowances, and Obsolescence," the principles to be observed are illustrated by examples applied to gas undertakings, and it is remarked that, since the term "obsolete" is not defined in the taxing statutes, the taxpayer is "more or less at the mercy of the Somerset House Authorities." The much disputed question of the allowance of legal costs, particularly those involved in obtaining Orders under the Gas Regulation Act, together with the equally vexed question of the assessment of the gas manager's house, are dealt with in a separate chapter. It would appear that the attitude of the Inland Revenue against the allowance of legal costs (except when they are incurred in the defence and maintenance of existing trade rights) is supported by the cases, while the question of whether the gas manager's house is or is not part of the works is largely a question of fact for the determination of the individual inspector of taxes, houses not part of the works being assessed separately.

It is recorded that recent Corporation Acts have contained a provision for the "pooling" of all accounts in the borough fund, which avoids the assessment of a municipal gas undertaking on its profit without regard to the loss incurred by (say) its electricity department, and thus places municipal enterprises on the same basis as other traders carrying on distinct businesses. Formulæ are given for the computations necessary when the municipal undertaking has to provide for certain public supplies, such as street lighting, and attention is drawn to the unfair competition from which a municipal department suffers *vis-à-vis* a company, by reason of the requirement that the local authority has to allocate a definite part of its surplus to a sinking fund for the repayment of loan capital. The part of the book dealing with income-tax concludes with some valuable information relative to the provisions regarding appeals against assessments, the form of dividend warrants, and the views of the Board of Inland Revenue towards the increasing amount of research and welfare work.

Local Taxation.

Having pointed out that the chief effective difference between income-tax and rates is that the latter have to be paid whether a profit or loss is being made, Mr. Seymour permits himself the usual complaint that the burden of high rates is having a retarding effect on industry and commerce. Economy—*i.e.*, the curtailment of social services—is the only solution, but it is politically impossible to advocate this in an age which chooses to regard itself as democratic. There is, however, substantial justification for the use of the word "anomalous" when describing the position of trading concerns, which contribute so largely to the rates and yet have no voting power to control expenditure. In a normal year the assessment of a gas undertaking to rates is equal to approximately 20 p.ct. of the divisible profits, and it should be noted that profits devoted to reducing the rates of a municipality are not exempt from assessment.

The history of local taxation for the relief of the poor is briefly outlined from the Elizabethan Act of 1601, which continued in force until 1836, to the Rating and Valuation Act of 1925, which required that "rateable value" should be ascertained in respect of hereditaments other than houses, land, and buildings, by estimating "the rent at which the hereditament might reasonably be expected to let from year to year if the tenant undertook to pay all the usual tenants' rates and taxes and tithe rent-charge, if any, and to bear the cost of the repairs and insurance and the other expenses, if any, necessary to maintain the hereditament in a state to command that rent." The proposed establishment of a Central Valuation Authority for Gas Undertakings and other "special properties" was postponed pending a Bill to provide for the assessment of such properties, and effect was not given to the suggestion that there should be a single valuation for both income-tax and rating. Gas undertakings are correctly valued on the "profits principle" and not the "contractors principle," a hypothetical tenant being introduced for the purpose of making the valuation. Since the result of rating is to increase the price of gas to the consumer by about 2d. per 1000 c.ft., it has been suggested that the rates should be raised by a direct assessment on the gas consumer by the rating authority, and Mr. Seymour points out that this would, at any rate, "eliminate that imaginary person, the hypothetical tenant, besides reducing the appeals now necessary."

In dealing with the principles of rating in actual practice in a gas undertaking, the method is again employed of describing *seriatim* the items in a specimen valuation of the "Blank Gas Company," and numerous examples and tables are given as necessary. "Gas Rentals," "Meter and Stove Rentals," "Residuals Sold," "Profits on Fittings," "Depreciation and Renewals of Works and Mains," and "Stocks of Coal and Oil" are referred to, while considerable space is given to the difficult question of the "Rating of Machinery and Plant." The deduction for the depreciation of gas fires, meters, and cookers has been fixed as high as 33⅓ p.ct., but the author suggests that a reasonable deduction from the replacement value, in normal circumstances, would be between 10 and 20 p.ct. The two methods customarily adopted for dealing with

"statutable deductions" are set out, and, in a table of computations stating the average repair costs of gas undertakings per 1000 c.ft. over the past four years, a figure of 1s. 5¼d. is given for Companies and 11d. for Departments.

In connection with the involved question of the rating of machinery and plant, the author quotes, if at somewhat disproportionate length, some very interesting extracts from the Majority Report, issued in 1925, of the Inter-Departmental Committee on the Rating of Machinery and Plant in England and Scotland. This resulted in the Rating and Valuation Act of 1925, which sought, *inter alia*, to secure uniformity in the making of assessments, to extend and schedule the machinery to be excluded from rating, and to remedy the inequitable comparison as between English and Scottish methods. Gas and other public utility undertakings, however, were specifically debarred from the rating relief on machinery thus extended to industry, and—in the erroneous belief that the relief would not be passed on to the consumer by the monopolistic undertakings—they were further excluded from the Rating and Valuation (Apportionment) Act of 1928. This provided, at a cost of £29,000,000 per annum, that agricultural land and buildings should not be rated at all, while industrial properties should be rated on only one-fourth of the net annual value, and freight transport concerns on one-fourth of the rates payable under the 1925 Act. Instead, the gas industry has been presented with the Coal Mines Bill, which enables the owners to increase, without let or hindrance, the price of coal to gas undertakings, and thus more than offset the benefit which the gas industry—having failed to secure inclusion in the Act of 1928—consoled itself it would indirectly obtain from the rating relief granted to the mines, as from Oct. 1, 1929.

Mr. Seymour concludes the text of his useful contribution towards the bibliography of the gas industry by dealing with "Special Points in Rating Practice," such as the repair and maintenance of public lamps and the question whether a gas department can appeal against an assessment made by the local authority in its capacity of rating authority, and by briefly outlining taxes such as super-tax, corporation profits tax, and stamp duties. He questions the desirability of applying the profits of a municipal gas undertaking towards the reduction of rates, especially where the area supplied extends beyond the geographical limits of the local authority, and suggests that the better method is to reduce the price of gas. He thinks that consideration should be given to the common practice of subsidizing a municipal electricity undertaking from the rates, which compels the gas company to maintain an inefficient competitor or enables the electricity department to reduce its charges.

"The Principles and Practice of the Assessment of Gas Undertakings for Imperial and Local Taxation" should find a place among the works of reference of all those interested in the gas industry, and Mr. H. T. Seymour is to be congratulated on having given such an able and succinct exposition of a difficult and important subject.

Notes on New Books.

"Solvents."—Vol. IV. of a series of monographs on applied chemistry, under the Editorship of Dr. E. Howard Tripp, has been published at the price of 10s. 6d. net (postage 6d.) by Chapman & Hall, Ltd. The work is by Dr. T. H. Durrans, on "Solvents."

National Physical Laboratory Collected Researches.—Vol. XXI., 1929, of Collected Researches of the N.P.L. has been published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 22s. 6d. net, 23s. 3d. post-free. The volume consists of reprints of recent papers dealing with the work of the Electricity Department of the Laboratory.

Assessment of Gas Undertakings.—"The Principles and Practice of the Assessment of Gas Undertakings for Imperial and Local Taxation," by H. T. Seymour, has been published by Walter King, Ltd., and is obtainable from the "GAS JOURNAL" Offices, 11, Bolt Court, Fleet Street, E.C. 4, price 10s. 6d. net. A review by J. R. Willis Alexander appears on earlier pages of our issue to-day.

Associations of Gas Engineers and Managers, 1929.—The reports have been published of the proceedings of the Associations of Gas Engineers and Managers during 1929. Full reports of the various papers and addresses at the Association meetings during the year are given, together with descriptions of several works, &c., visited in the course of the same period. At the end of the book are complete lists of the office-bearers and members of all the Associations concerned. The publication, which is complete with photographs and diagrams, is well up to its usual high standard, and is obtainable from Messrs. Walter King, Ltd., 11, Bolt Court, Fleet Street, E.C. 4.

"Chemical Engineering and Chemical Catalogue."—The sixth annual edition of this useful work has been published by Messrs. Leonard Hill, Ltd., 231-232, Strand, W.C. 2 (annual subscription, 10s. 6d.; single copies, 15s.). The Editor is Dr. D. M. Newitt, and the volume is compiled with the co-operation of leading British manufacturers. Many improvements have been made in the present edition, not the least attractive among which is the new binding. The data and tables section has been doubled; many of the tables have been specially compiled for the Catalogue, and are published for the first time. The volume is already widely circulated and used in the Colonies, Dependencies, and British Possessions; and to increase its foreign circulation and its value to those speaking other languages, the main index, which is the key to the book, has been set in Spanish as well as English.

"Plumbing and Gasfitting."—Vol. III. of this practical work has been published by Sir Isaac Pitman & Sons, Ltd., at 6s. net. The complete work will comprise six volumes, under the editorship of Percy Manser; and the present volume deals with Domestic Hot Water Supply, by L. J. Overton; Pipes and Pipe Bending, by S. P. Marks; and Heating and Cooking, by E. R. B. French. The book is excellent, and thoroughly to be recommended. Modern equipment for the production of hot water by various methods is explained and illustrated, and problems which may arise in the working of different appliances are considered. This is followed by the section on pipe bending; the manufacture of pipes is dealt with briefly, but the bulk of the section is devoted to the methods by which tubes of various materials may be bent to any desired shape. The final section, on heating and cooking by gas, shows the progress that has been made in the use of gaseous fuel.

Law in Industry.—The number of points at which industry is brought into contact with the Law have increased so rapidly during recent years that there can be few so fortunate as to be able to go through life without having almost daily to conform to the provisions of some Act of Parliament or other. It seems, therefore, almost trite to say that every business man ought to possess a wide knowledge of all legal enactments affecting him. But does he? His time is valuable, and the Law is long-winded; moreover, it is far from easy to grasp the force and intention of legal documents, so that it very often happens that a full appreciation of any particular aspect of Law is postponed until an infringement of its provisions makes its study an unpleasant necessity. If laymen had to deal only with Acts of Parliament, the Law, though not simple, would at any rate be within easy reach and available for study by all. Law, however, is by no means covered by statutes which can be purchased at the Stationery Office; and that is where the main difficulty arises. That there is a desire among business men for a fuller knowledge of industrial law was made very clear at a course of lectures on the subject delivered recently at the Sir John Cass Institute. The lecturer was kept so busy with questions of all sorts both before and after the course that it was decided to satisfy the obvious demand which existed for information on this subject by re-writing and expanding the lectures into a book, which has now been published under the title of "Law and Industry" (by G. S. W. Marlow; published by Bailliere, Tindall, & Co.; price 18s. 9d. post free). To the man, be he young or old, who occupies an executive position, this book provides in simple, straightforward language the pith of industrial law, and it is written in such an easy style that its study is not tedious, and facts can be quickly grasped.

Colchester Preference Stock Issue.—As will be seen from our advertisement columns, Messrs. A. & W. Richards, of 37, Walbrook, E.C. 4, are offering for sale by tender, on behalf of the Directors of the Colchester Gas Company, £15,000 6 p.ct. irredeemable preference stock at a minimum price of issue of par. The minimum amount of stock which may be tendered for, or will be allotted, is £50. Applications for this issue must be received not later than 11 o'clock a.m. on Thursday, April 3.

Blyth Council Consider Purchasing Gas Company.—At a meeting of the Blyth Town Council the report of the Lighting Committee on the Gas Company's statement of accounts, brought up the question of the acquisition of the Company as a municipal undertaking. Councillor Rafferty suggested that the matter be referred back to the Committee. The Chairman of the Committee, Councillor Hyde, said he would welcome the opportunity of discussing the matter to the fullest possible extent in committee and then in full Council.

Commercial and Industrial.

Stock Market Report.

[For Stock and Share List, see later page.]

Business on the Stock Exchange last week displayed a more optimistic outlook; and while the gilt-edged section still dominated the situation, a certain liveliness was apparent in most markets. Gas stocks and shares were in greater demand, and (as will be seen from the Stock and Share List) no less than thirteen stocks increased in value. Gas Light £1 units, which have been undervalued for some time past, recovered part of the final dividend recently deducted from the price, and hardened 6d. to 18s. 1½d. Business was done at as high as 18s. 6d., so that, having regard to the high-class security offered, some further improvement is certainly justified. The 3½ p.ct. maximum, 4 p.ct. preference, and 3 p.ct. debenture stocks of this Company also increased in value. The sliding-scale and maximum dividend stocks of the Croydon Company each gained 1 point to 104½ and 82½ respectively. The former stock changed hands last year at 114, so that it is evident that it is underpriced at the present time. There were some inquiries for debentures, and Commercial 3 p.ct. and Southampton 4 p.ct. each rose 3 points to 58½ and 73½. Other improvements were: South Metropolitan 6 p.ct. preference 1½ to 108½, and 3 p.ct. debenture 1 to 57½; Southampton 5 p.ct. maximum 1 to 77½; Tottenham ordinary 1 to 102; and Wandsworth 5 p.ct. debenture 1½ to 94½.

Coal Markets.

The markets are quiet all round, and business is on a very disappointing scale. Orders recently received on the Newcastle Exchange for Northumberland steams have enabled this section to maintain its position, and Durham coking coals have been in slightly better request. But the demand for gas coals is far below normal, and prices are inclined to sag. Wear special qualities are still quoted nominally 17s. f.o.b., but prompt orders can be satisfied at less than this. Best qualities are 16s., and seconds anything down to 13s. 6d. Coking unscreened is rather harder at 14s. 6d. for best makes. There is a good deal of general inquiry, but buyers abroad will not operate even at the present reduced prices. Presumably they are waiting to see what they can get out of the marketing schemes.

Yorkshire markets report very disappointing conditions. Foreign exports from Humber ports for the week ended March 11 were 101,204 tons, compared with 152,383 tons for the corresponding week last year. The official export quotation for screened gas coal at 15s. 9d. to 16s. 6d. shows a considerable decrease against a week ago.

The mild weather has greatly eased the demand for gas coke, and supplies in most parts appear to be plentiful at about 21s.

Trade Notes.

The Painting of Structural Steelwork.

An interesting publication by Messrs. D. King & Son, Painting Contractors, of 145, Campden Crescent, Chadwell Heath, Essex, deals with the scientific painting of gasholders and structural steelwork. All work is done by hand brush or spray; and the firm can supply any brand of paint or clients can supply their own as desired. The firm make a point of thoroughly cleaning all steelwork before painting.

John G. Stein & Co. Refractories.

Messrs. John G. Stein & Co., Ltd., of Bonnybridge, Scotland, have published a new pamphlet on their various kinds of refractories for iron and steel works, blast-furnaces, and coke ovens. The firm give close attention to the production of goods of uniform quality and of accurate shape and size. All their products are burned in modern kilns at high temperatures so that after-contraction or after-expansion during the subsequent use of the bricks is reduced to negligible proportions.

High-Speed Vibrating Screens.

A new publication by the General Electric Company, Ltd., deals with a new range of screens of the high-speed vibrating types, which are being manufactured at the firm's Fraser & Chalmers engineering works. With the increasing interest that is being taken in the subject of screening throughout the gas and coke ovens industries (more particularly for coke, as a result of the demand from the domestic coke market in quarries due to the activity of the road-making industries, and in collieries as a result of the demand for a carefully graded and uniform product) these screens should be of interest.

Doing Away with Chimney-Breasts.

A pamphlet recently published by the Nautilus Fire Co., Ltd., of 60 and 62, Oxford Street, W. 1 (Proprietors: The Davis Gas Stove Co., Ltd.), deals in an interesting and practical manner with "Nautilus" gas flues. Comprehensive sectional diagrams are included, and among the points emphasized are that an entirely separate flue must be provided for each fire-place and that there are no exceptions whatever to this rule. The flue must never be terminated beneath the eaves or on the face of the wall, continued the pamphlet. It should be carried through and well above the roof to terminate in the concrete stack provided. The orthodox method of flashing to the roof in lead and to the first complete course-joint above the roof is recommended. Since mortar "fangs" inside the flue seriously obstruct the passage of the products of combustion, great care should be taken to clean off any cement that may adhere to the inside of the blocks. A good method of keeping the passage free of mortar is to make use of a piece of sacking with a length of string tied to it. The sacking is drawn upwards through the flue as the blocks are fixed, so that it is always just below the top of the block last laid. It is withdrawn when the top of the flue is reached, and when only the terminal remains to be fixed.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 24.

To-day's prices for tar products are as follows:

Creosote for export is 6d. to 6½d. per gallon f.o.b.

Pitch is 47s. 6d. per ton f.o.b.

Pure toluole is 2s. 5d. to 2s. 6d.; solvent naphtha, 95/160, about 1s. 5d.; pure benzole, about 1s. 11d.; and pyridine bases, 3s. 9d., all per gallon.

Tar Products in the Provinces.

March 24.

The average prices of gas-works products during the week were: Gas-works tar, 21s. 6d. to 26s. 6d. Pitch—East Coast, 46s. f.o.b. West Coast (f.a.s.)—Manchester, 40s. 6d. to 41s.; Liverpool, 44s. to 45s.; Clyde, 44s. to 45s. Toluole, naked, North, 1s. 7¼d. to 1s. 8¼d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 1s. to 1s. 0¼d. Creosote, in bulk, North, liquid and salty, 3½d. to 3⅝d.; low-gravity, 1½d. to 1¼d.; Scotland, 3⅜d. to 3⅝d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. 4d. to 2s. 5d. prompt. Naphthalene, £12 to £14. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Tar Products in Scotland.

Glasgow, *March* 22.

A little more interest has been shown in tar products during the week, but no material alteration in prices can be recorded.

Pitch is unchanged, the nominal value being 47s. 6d. to 50s. per ton f.a.s. Glasgow for export. Home orders are scarce, and price is easy at 50s. to 52s. 6d. per ton.

Tar.—Some business has been placed for forward delivery at 4d. to 4¼d. per gallon naked at works.

Creosote is in the background, and values are easy. B.E.S.A. specification is lower at 3½d. to 4d. per gallon; while low gravity and neutral oils remain at 3d. to 3½d. per gallon—all in bulk f.o.r. makers' works.

Cresylic is still showing some activity for prompt, and prices are unchanged. Pale 97/99 p.ct. is 1s. 8¾d. to 1s. 9¾d. per gallon; dark 97/99 p.ct., 1s. 7¼d. to 1s. 8¼d. per gallon; pale 99/100 p.ct., 1s. 11½d. to 2s. 0¼d. per gallon; high boiling, 1s. 10d. to 1s. 11d. per gallon—all *ex* works.

Crude naphtha has been changing hands at about 5d. to 5½d. per gallon *ex* works.

Solvent naphtha is showing no sign of revival, and 90/160 and 90/190 grades are unaltered at 1s. 2½d. to 1s. 3½d. and 1s. to 1s. 1d. per gallon respectively.

Motor benzole is 1s. 6d. to 1s. 6½d. per gallon naked at works. The market is quiet.

Pyridines.—Nominal prices are 4s. 3d. to 4s. 6d. for 90/140; 3s. 3d. to 3s. 6d. for 90/160; 2s. 6d. to 2s. 9d. for 90/180; and about 1s. 6d. to 2s. for 90/220—all per gallon *ex* works.

Benzole Prices.

The following are considered to be the market prices at the present time:

	s. d.	s. d.	
Crude benzole . . .	0 10 to	0 11	per gallon at works
Motor ,, . . .	1 5½ ,,	1 6½	,, ,, ,,
Pure ,, . . .	1 10 ,,	1 11	,, ,, ,,

Overseas Opportunities.

[From the Board of Trade Journal.]

Canada.

Standard Black Screwed and Socketed Tubes.—The Department of Overseas Trade has been informed that a firm in Canada are desirous of receiving quotations from British firms for the supply of standard black screwed and socketed tubes in sizes ranging from ⅛-in. to 3-in. diameter in random lengths. Firms desirous of offering tubes of British manufacture can obtain further particulars of this inquiry upon application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W. 1. (Ref. A.X. 9285.)

Topical Items.

Bath Gas Company's Expansion Proposals.

The Bath Gas Company are negotiating to acquire the Chippenham Gas Company and the Corsham Gas Company. The former dates from 1834, and supplies the Borough of Chippenham, but the deal now being put through provides for a considerable extension of the existing area. The capital is £41,000, of which £25,900 is paid up, and, in addition, there is a debenture debt of £8000. The Corsham concern is a smaller affair, but it has been in existence since 1851. The capital is about £5000.

The purchase of both concerns will be effected by an allotment of ordinary and debenture stock of the Bath Company.

At present, with the exception of three parishes—Box, Limpley Stoke, and Colerne—the jurisdiction of the Bath Company is confined to Somerset, but the new acquisition will give them an increased and increasing hold on Wiltshire.

Advisory Committee on Fuel Technology at the Sir John Cass Technical Institute.

Reference was made in the Jan. 15 issue of the "JOURNAL" to the development of the work in Coal Carbonization and Fuel Technology at the Sir John Cass Technical Institute, Jewry Street, Aldgate, E.C. 3, and in this connection it is interesting to learn that an Advisory Committee has now been formed consisting of the following:

—	Nominated By.
Dr. C. H. Lander	..
Mr. E. V. Evans	..
Mr. T. Hardie	The Gas Light and Coke Company
Mr. J. Terrace	The Institution of Gas Engineers
Dr. R. Lessing	The Institute of Fuel, and The Institution of Mining Engineers
Dr. F. B. Thole	The Institution of Petroleum Technologists
Mr. J. Arthur Reavell	The Institution of Chemical Engineers
Mr. A. McCulloch	The Society of Chemical Industry
Dr. E. W. Smith	The Society of British Gas Industries
Mr. T. Westthorp	The Coke Oven Managers' Association

At the first meeting of this Committee, which was held on March 12, Dr. Lander was unanimously elected Chairman, and Mr. E. V. Evans Vice-Chairman.

Middlesbrough Gas Department Goes on from Success to Success.

The following is an extract from the Budget Speech of Councillor J. Wesley Brown, Chairman of the Finance Committee, at a meeting of the Middlesbrough Town Council on March 11 last.

From time to time when I have had to make this statement it has been my pleasure to congratulate the Gas Committee and Department on the splendid work they are doing. They go on from success to success, and at the present time the supply in Middlesbrough, I believe I am right in saying, is the cheapest in the United Kingdom. During the year a further reduction in the price has been made, and at the present time we are selling gas at 1s. 10d. per 1000 c.ft. net. Commencing April 1 next we are compelled by the Gas Regulation Acts to alter the basis of the charge from the present method of cubic feet to a charge per therm.

At the joint meeting of the Rating and Valuation Committee and Finance Committee, I indicated to the Press that Middlesbrough enjoyed certain benefits in respect of cheap gas. I want to emphasize the fact that the revenue from one penny in the price charged for gas is equal to a rate of 1½d. in the pound, so that if we thought it wise to maintain a higher price in order to take profits on gas for the relief of the rates, the rates would benefit to that extent. For very good reasons we do not think it wise, either from a financial point of view or from a public service point of view, to adopt such a policy. The Council has therefore restricted the sum which may be taken each year from available profits to an amount equal to 1½ p.ct. of the outstanding debt of the undertaking. The amount appropriated in the current year is £5870.

The Gas Industry as a National Service.

Even the busiest of men must eat, and the idea of periodical luncheons, at which those who have little time to spare can meet and discuss their own affairs, in addition to hearing short addresses on matters of importance, is one that to-day finds considerable favour. The American Chamber of Commerce in London adopt this excellent method of "keeping together," and it was a pleasure to be with them in the Edward the Seventh Room of the Hotel Victoria, Northumberland Avenue, on Tuesday of last week, when the President and Chairman, Mr. F. E. Powell, had at his right hand as the speaker and guest of honour Sir David Milne-Watson, LL.D., D.L., Governor and Managing Director of the Gas Light and Coke Company. In introducing the speaker of the day, Mr. Powell said that the biggest thing in gas was not in the United States, but in this country, and was represented by the Gas Light and Coke Company. Sir David had been responsible for the development of this Company during many years; and he had directed matters in such a way that the undertaking had contributed to the prosperity and happiness of this great city. His social work on behalf of the employees was as great as his labours in other branches.

The long and honourable history of the gas industry in this country was briefly sketched by Sir David Milne-Watson, who reminded his audience that a few months ago he had had the great honour of addressing from his own office in Westminster the annual convention of the American Gas Association in Atlantic City. It was a unique experience to him to speak into a microphone to some 6000 delegates assembled 3000 miles away, at the biggest meeting of gas men that had ever been held. Pursuing his subject, he said the gas industry was still fettered by the absurd notion held by many of the public that it was a monopolistic one, though at the present moment it was met by the fiercest opposition from oil and electricity—not to mention coal. Obsolete legislation hampered it greatly; for it was still subject to laws passed in 1847 and 1871. The industry had also suffered from the idea in this country that electricity was a thing that must be cultivated from the national and political points of view at all costs. The chief anxiety at the present moment of the gas industry was as to this question. They did feel that they, as an industry, by their long record, had earned the good opinion of the country, and that they should not be trammelled and hampered any longer by the antiquated legislation which governed them. The industry in America had been fortunate in not having had its development thwarted, and had grown vigorously in freedom from the restrictions on this side. From what he had heard, he had been led to admire greatly the gas industry in America—especially in connection with powers of charge. He had been warmly welcomed in America by the Consolidated Gas Company of New York, and he had also received much useful information from his friend Mr. Samuel Insull, of Chicago.

Turning again to this country, Sir David said they could not expect to see gas and electricity working hand in hand. It would be the ideal state of affairs, because there was no doubt that there was a field for gas and a field for electricity quite distinct from one another, where they could both help to serve the public, each in its own sphere. The opportunity was lost in this country years ago, when the electricity industry came into existence, no doubt partly by the complacency of those at the head of the gas industry, who thought that electricity was a toy, and could never touch them. It was now very doubtful whether for many years it would be possible to unite these two industries. This was another matter in which they were wiser in America, where gas and electricity were linked together. The result was a saving of much money. They did not compete for business which each of them should leave to the other, and the community reaped the advantage. The gas industry did feel strongly that, as gas was no longer a monopoly, but had its field contested by both electricity and oil, they should be given by Parliament that freedom of action which was so necessary to their own welfare, and therefore to the welfare of the community. Their real ambition was to give the most effective service to the greatest possible number of people for the greatest number of purposes. Nothwithstanding all the competition they had endured, enormous progress was being made by the gas industry in this country. During the last twenty years, they had expanded in an altogether undreamed-of way. The sales of gas had gone up no less than 65 p.ct. in that period. Considering the number of their rivals, this was a very fine record. The industry had done much also in improving the conditions of service of those employed in it. In his own Company, the employees held no less than £800,000 of ordinary stock. This was a very fine thing and led to stability and goodwill.

Gas Cookery Demonstrations at Sutton.

A series of practical cookery demonstrations held by the Sutton Gas Company at their Demonstration Room, 19-21, High Street, Sutton, were a great success, some seven hundred consumers attending during the period.

A cake baking competition was held in connection with the demonstrations, there being 110 entries. Miss Sketchley, M.C.A., the Cookery Demonstrator, had great difficulty in deciding the prize winners, as the exhibits were of a very high standard.

Six prizes were given, two silver cake dishes being provided by Messrs. General Gas Appliances, Ltd., Guide Bridge, Manchester, the other four, comprising "Orlak" ovenware and aluminium cooking utensils, being given by the Sutton Gas Company.

At the final demonstration on March 14 Mr. Henry Gage, Engineer and Manager of the Company, presented Miss Sketchley with a travelling clock, as a small appreciation of the hard work she put in in connection with the competition. A few lady exhibitors also presented Miss Sketchley with a leather hand-bag.

Low-Temperature Carbonization and Nottingham's Gas Supply.

A decision regarding the future of Nottingham gas supply was arrived at by the Gas Committee at a meeting on March 14. Some time ago a tentative offer by a London Syndicate was under consideration, whereby it was proposed to utilize the gas from a low-temperature carbonizing plant to be established at the Gedling Colliery for augmenting the city supply. However, nothing came of the negotiations.

Now we understand that matters have matured in another direction, an offer having been accepted which will ensure the supply of 1,725,000 c.ft. of gas annually from the output of low-temperature carbonizing works which are being established by a Subsidiary Company in connection with the Pinxton Collieries. Should the supply from the Pinxton district be ultimately increased to 5 million c.ft. annually, an appreciable reduction may be involved in the number of men at present engaged at the carbonizing stations of the Nottingham Corporation. In view of the new departure it has been determined not to fill up the places of men who retire after reaching the age of 65.

Scottish Western Juniors Visit the Inchgreen Gas-Works, Greenock.

On Saturday, Feb. 22, members of the Scottish Junior Gas Association (Western District) visited the Inchgreen Works of the Greenock Corporation Gas Department. The visitors were met by Mr. Ronald D. Keillor, Assistant Engineer and Manager, who is also President of the Association, and were conducted round the works.

The works are conveniently situated for both railway and river communication. The area of the site is approximately 8¾ acres. In the old retort house, now used as a coal store, there are still 14 horizontal regenerative settings of "eights," capable of being hand-operated to produce 741,000 to 800,000 c.ft. of gas per day.

In 1913-14 a complete installation of vertical retorts with mechanical wagon tipper, coal breaker, conveyors, hoist, &c., was erected by the Woodall-Duckham Company. This installation of modern coal carbonizing plant was brought into use in December, 1914. The plant consists of two parallel benches of eight settings, each setting containing four retorts, producer, regenerator, &c. These settings were completely rebuilt upon latest principles in 1926 and 1927.

With average quality Scotch coal as delivered, the gas producing capacity of the original vertical retort settings was 1,850,000 c.ft. per day, but 3,500,000 c.ft. per day is now available.

A water gas plant was erected in 1918, capable of producing 500,000 c.ft. of blue water gas per day.

After the inspection, the members were entertained at tea in Mackay's Restaurant, Greenock.

Bailie Munro, Convener of the Gas Committee, welcoming the visitors, said how proud they were in Greenock of Mr. George Keillor, the Gas Engineer and Manager.

Mr. D. Melvin (Uddingston), returning thanks, remarked that the working results of the Greenock Works showed sound financial management and administration, coupled with scientific control. Progress and orderliness were in evidence everywhere.

Mr. Andrew Walker (Kilbarchan) supported Mr. Melvin's vote of thanks, and reply was made by Mr. Keillor, who expressed his belief that order in a works was a big factor in efficient operation. Cheap gas with attentive service was the policy at Greenock.

Prize-Giving at Westminster Technical Institute.

The annual distribution of prizes by Sir David Milne-Watson, D.L., LL.D., to successful students of the Gas Department of Westminster Technical Institute was held on Thursday, March 20, at the Horseferry Hall, Westminster, which was loaned for the occasion by the Court of Directors of the Gas Light and Coke Company.

Mr. F. W. Goodenough, C.B.E., Chairman of the Advisory Committee, in an interesting speech, said that the work of the Gas Department at the Westminster Technical Institute was an outstanding example of the successful co-operation existing between the educational authorities and industry. No fewer than a thousand employees of the Gas Light and Coke Company were attending the Westminster Technical Institute for technical courses under the Institution of Gas Engineers' Education Scheme, with the result that 450,000 students' hours would be worked at the Institute this session. It was interesting to note that the Gas Light and Coke Company's Scheme for the training of gas-fitter apprentices had recently come of age, having been founded in January, 1909. There were now 400 lads in training, all of whom were attending the Institute either for one whole day per week or as evening students.

Sir David Milne-Watson then presented the prizes to the successful students in the internal examinations, and certificates to those who had satisfied the examiners in the Institution of Gas Engineers and City and Guilds of London Institute examinations.

In a highly interesting and humorous address, Sir David commented on the thirst for education which existed in his native land north of the Tweed. The success of the Scots was due, said he, to the great sacrifices which they had made in their student days. It was quite a common thing for undergraduates at the Scottish Universities to work during the long summer vacations in order that they might earn the money to pay for their education. One day in each term was known as "Meal-day," and originated from the time when poor undergraduates were given a holiday to go home and fill their bag of oatmeal, which comprised their principal diet during term. While not suggesting that the students of Westminster should live on oatmeal—excellent though it was—he did want to stress the importance of education and culture.

The Outlook for Smokeless Fuel.

In a Chadwick Public Lecture at the Institution of Mechanical Engineers on Thursday last, March 20, Dr. Margaret Fishenden, D.Sc., F.Inst.P. (Fuel Research Division, Department of Scientific and Industrial Research), said that many authorities were averse to the practice of burning raw bituminous coal, and considered that it should be subjected to some treatment which would convert it into forms capable of being utilized without smoke emission. Various processes were available for the manufacture of such smokeless fuels as gas, coke, and oils from coal, or, alternatively, it could be used for the generation of electricity. The development of such processes was, however, obviously dependent upon their commercial possibilities. The operations involved naturally could not be carried out without expense, and as a result the price of gas or electricity on a thermal basis was much higher than that of raw coal, although sometimes the greater efficiency with which they would subsequently be utilized was able to counterbalance this discrepancy. The use of gas, and to a lesser extent of electricity, was steadily developing, particularly for cooking and intermittent heating purposes, but at current prices their complete substitution for coal would in the majority of cases be impracticable.

Gas coke, observed Dr. Fishenden, was smokeless, and if of good quality was an excellent fuel for central heating systems or for independent boilers, but in ordinary grates it was somewhat difficult to light, and did not burn freely; the ash also was liable to cause trouble. Recently several grates designed specially for use with coke had been put on the market. Much attention was also being devoted to the possibilities of developing new processes for the production of improved types of solid smokeless fuel by means of carbonization at low temperatures. Several large-scale installations were now running, and evidence as to their economic position should in due course become available. Low-temperature coke, like gas coke, varied in quality with the nature of the coal from which it was made and the method of preparation, but both its physical and its chemical properties favoured easy ignition, and if adequate supplies could be put on the market at a reasonable price the solution of the smoke problem would be greatly assisted. Great Britain's domestic coal consumption was, however, very heavy, and showed no immediate signs of diminishing. Progress was, therefore, at the best, bound to be gradual, although by a suitable distribution of coke, gas, and electricity it might be accelerated.

Mr. Fred Davies Addresses Walsall Rotary Club.

Mr. Fred Davies, Manager of the Walsall Corporation Gas-Works, delivered an address to the Walsall Rotary Club last week on the subject of lighting.

His ideal of a public utility service would be combined gas and electricity. Electricity would be generated by means of either steam or internal combustion engine. If steam, then the boilers would be fired by clean gas, doing away at once with the cleaning of flues, and would bring about increased thermal efficiency of the boilers, longer life of plant, vastly more flexible conditions of working, and improved conditions for the workpeople employed. The same quality gas as used under the boilers or gas engines at the electricity generating stations would be supplied to the town for industrial purposes and domestic heating and cooking. The advantage would be that the prime mover would be capable of being stored and tapped off as the demand of the district required it.

The present method of keeping boilers under partial load to meet the varying demands made upon the plant would be in a very large measure done away with. The bye-products of the coal would be recovered, and the resultant pure ash would make admirable concrete for building purposes.

With modern engineering knowledge placed at the disposal of the designers, such a type of plant could be constructed which would be almost automatic in its working, and gas could be produced at such a low cost that it would completely do away with the old open fire, which is the greatest cause of atmospheric smoke pollution.

Encouraging Remarks at Sheffield Company's Co-Partnership Dinner.

The valuable work that the Sheffield Gas Company is doing and is going to do to help the city's chief industry by supplying it with cheap coke oven gas was pointed out by the Company's Manager (Mr. R. Halkett) at the second annual dinner of the co-partners of the Company. About 350 were present.

Responding to the toast of "The Chairman," Mr. Halkett said Lieut.-Col. H. K. Stephenson, the Chairman of the Company, had recently commented on the splendid team-spirit among them with very great pleasure, and it was a privilege to himself to endorse that, because he realized that if they were to have success, it could only be obtained by good feeling and the team-spirit. Speaking of competition, Mr. Halkett said there was room for both gas and electricity. It was said that when electricity came to the front gas would be a dead-letter, but he personally was never going to think it. He would not be surprised if the "grid" system came into operation in the gas industry. They were all anxiously awaiting the report of the area Gas Supply Committee sitting under the Government at the present time, and until that was put forward, they could not say what would take place.

BENEFIT TO SHEFFIELD.

But there was one thing that he and his Board believed in—that coke oven gas should and must be utilized for the benefit of the community at large. It could only be used properly and efficiently through gas undertakings. Much research work had been done in the 130 years of the gas industry, and no other industry should step forward and reap the seed they had sown. They in Sheffield were in the heart of one of the biggest industries in the British Isles, and it was essential that they should play their part in that industry. They could only do it by giving it cheap fuel and thus help to compete with other industries abroad. They had done it, and he was confident that it would be an even bigger benefit to Sheffield in the future.

Mr. Halkett thanked some of the older employees who had recently been pensioned off. He assured them that both he and the Directors had the welfare of the employees at heart. He felt that he had a team behind him, and no matter what he put forward for the success of the department, he would be backed up to the hilt.

Proposing the toast of "The Chairman," Mr. J. W. Lidster, a member of the Co-partnership Committee, outlined the progress of the Company from its early days, and appealed for an even stronger team-spirit, which, he said, would operate for their mutual benefit and for that of the industry at large.

POOLING THEIR BRAINS.

Alderman C. W. Gascoigne, also a member of the Committee, seconding, said co-partnership enabled them to pool their brains and resources, and they were becoming part-owners of the undertaking instead of merely employees.

Speaking of competition, Alderman Gascoigne said a few years ago the Authority in Sheffield did not want to make the gas undertaking a municipal concern mainly because they thought it was a dying industry. "I think they are beginning to realize that they are wrong," he went on. "The stocks of the Company are higher than ever, and we are supplying more gas than ever we did, and the prospects are perhaps better than they have ever been in the history of the Company. If we can hold our own in the face of widespread unemployment, we must do even better when the wheels of industry begin to revolve once more."

If electricity undertakings were going to amalgamate, it might be well to amalgamate gas undertakings. All they asked was a fair field and no favour.

Co-Partnership at Bournemouth.

"I think there is room for both gas and electricity," said Mr. William Cash, Chairman of the Board of Directors, at the annual meeting, on Friday, of the co-partners of the Bournemouth Gas and Water Company. He gave an encouraging review of the progress of the Company, and spoke in terms of satisfaction of the future before the gas industry.

It was a matter for great satisfaction, he said, that the Company's showroom window display had won first prize in a competition open to the whole country. Last year the sales in the showrooms amounted to over £60,000, and from 1912 to 1928 the public spent over £510,000 on gas appliances. The point about this was that it ensured a continuance of custom for gas supply and stabilized the Company's business.

For the whole year there had been an increased output of 177 million c.ft. During the year 1929 the Company had sent out 2421 million c.ft. In 1919 the output was 1286 millions, so that in ten years the output had been very nearly doubled.

Mr. Cash submitted the report of the Committee of the Co-partnership Scheme for the year ended Dec. 31, 1929, together with an abstract of the accounts. The bonus to co-partners was calculated at the rate of 9 p.ct., as compared with an average rate of 8¾ p.ct. for 1928. The total amount of bonus credited to co-partners for the year was £10,630, making a total for the period from 1908 to 1929 of £100,844. The number of shares transferred to co-partners during that period was 2747, representing a total value of £36,285. In addition, approximately 220 ordinary shares (sliding-scale) were about to be transferred, or allotted, to the co-partners, whose accounts entitled them to shares at the price of £12 17s. 4d. per share.

With regard to the pensions fund, £163,754 was standing to the credit of the fund on Dec. 31, 1929, of which £142,403 was invested in securities. Mr. Cash expressed satisfaction at the bonus and in regard to the flourishing condition of the co-partnership scheme, and he commented particularly upon the healthy growth of the pensions fund.

Extending a warm welcome to Sir George Jessel, Mr. Cash explained that Sir George had succeeded his father, Sir Charles Jessel, on the Board of Directors. In conclusion, he mentioned the retirement, at the end of the present month, of Mr. W. B. Bright, the Company's Chief Cashier at Bournemouth, who has been in the service of the Company for some 37 years. He is to be succeeded by Mr. C. Field, who has also been for a number of years in the employ of the firm.

Sir George Jessel paid warm tributes to the work and ability of Mr. Cash and Mr. P. G. G. Moon, the Engineer and General Manager of the Company. It was announced by Mr. Cash that at the end of the month the price of gas would be reduced to slightly under 3s. 3d. per 1000 c.ft.

Plymouth Gas Department Budget.—A capital expenditure next year of £31,500 has been budgetted for by the Plymouth Corporation Gas Committee, which estimates an expenditure during the same period of £172,175. It has been decided to proceed with the erection of a new gasholder.

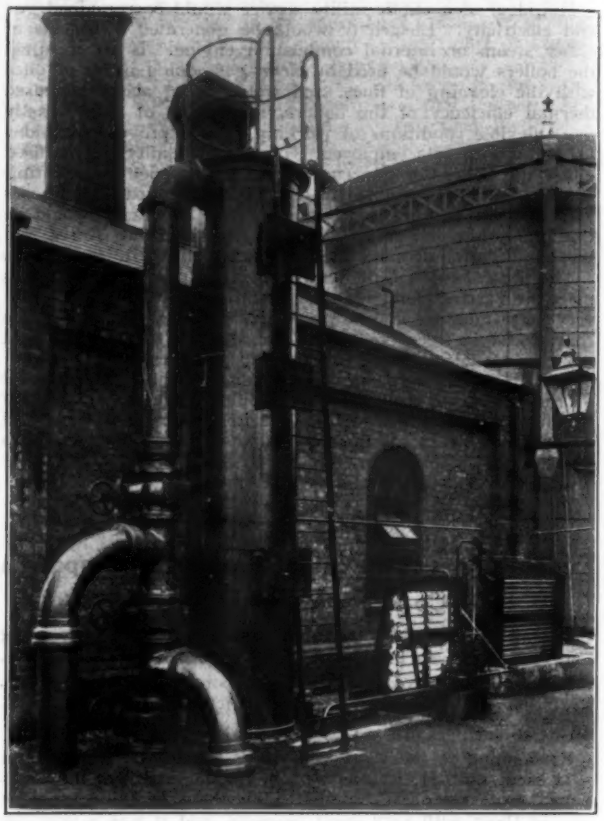
Price Fixing at Enniskillen.—The Enniskillen Gas Company have made application to the Ministry of Commerce for an order under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, as continued by the Expiring Laws Continuance Act (Northern Ireland), to enable them to continue the price of 9s. per 1000 c.ft. The previous Order made by the Ministry expires on the 31st inst. The statutory powers of charge as fixed by section 28 of the Enniskillen Gas Act, 1894, were limited to 8s. per 1000 c.ft.

New Coke Venture at Lepton.—A Company, to be known as Huddersfield Collieries, Ltd., now in process of formation, is to lay down plant at the pit-head of a Lepton colliery for the manufacture of coke and the treatment of bye-products. It is understood that the Company have offered to sell the gas produced in the process of coke making to the Huddersfield Corporation. The Company claim that they will be able to supply gas at a cheaper rate than the Corporation can make it. The Ministry of Health have been asked for their observations on the proposals. A special Sub-Committee of the Huddersfield Corporation Gas Committee are also considering the proposals.

Gas Dehydration for Small Works.

By F. Porteous, Engineer and Manager to the Ware Gas Company.

The writer has an interesting report to make on the result of installing a gas dehydration plant on a works of an annual output of 45 million c.ft. The plant in question is similar in principle to other Holmes " Dri-Gas " plants which have been described from time to time, but it embodies special adaptations for small outputs. The installation has been already fully justified by the results, though it has been in operation only five months. The plant in question was supplied by Messrs. W. C. Holmes & Co., Ltd., to the Ware Gas Company, and has been in the writer's charge. A photograph of the plant is reproduced herewith.

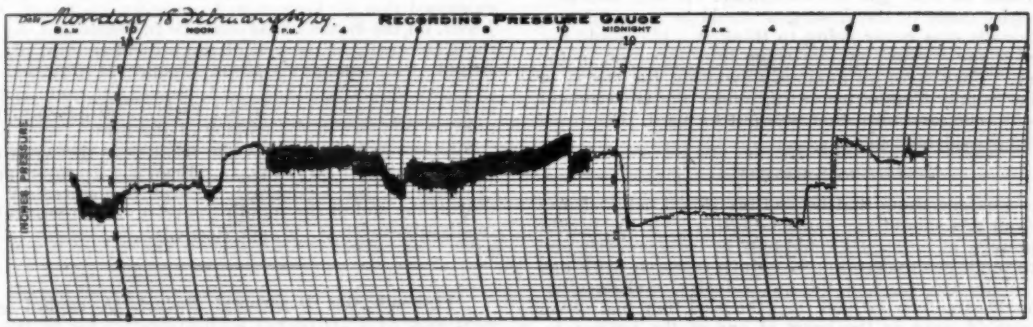


Holmes "Dri-Gas" Plant at Ware.

The results are admirable. I had regarded the process as something desirable, but rather in the nature of a luxury—particularly for a small works. My view now is that it is more than a refinement—it is a necessity, and quite as important a unit as the scrubber or the purifiers. This may sound somewhat exaggerated, but last winter we were seriously troubled by oscillation at times of peak load, due to a pocket of water somewhere in the trunk main near the works. Within a week from starting, the dry gas had picked up enough of the water to stop the oscillation, and the daily pressure chart taken at the showroom in the town steadily improved. Now, after five months, there is a general steadiness throughout the day and evening, and an additional showing of quite 8-tenths pressure at times of peak load. Examples of the charts are reproduced here, and the contrast is impossible to ignore.

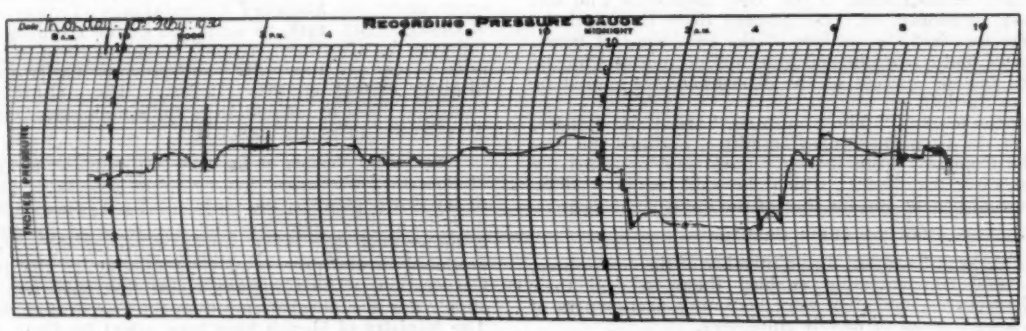
The mains are somewhat small and old, and the trunk mains are in wet subsoils, so I consider that the dry gas has picked up water pockets and possibly old naphthalene deposits. Syphons near the works used to yield from two to three gallons at the weekly pumpings—now they blow, and we have ceased pumping. There has also been a marked falling-off in complaints of deficient or jumping supplies; in fact, the service cleanser is going out of commission. Reports from other users of the " Dri-Gas " process tell of a drop in meter repairs, and we feel sure that our experience will be the same.

Altogether, the process is a sound economic one, and soon pays for itself. Anything giving better service to the consumer and ensuring a steady and trouble-free supply is highly de-



PRESSURE RECORD ON FEB. 18, 1929. OUTPUT OF GAS, 165,800 C.FT.

[Note oscillation.]



PRESSURE RECORD ON FEB. 10, 1930, AFTER INSTALLATION OF HOLMES "DRI-GAS" PLANT.

[Note absence of oscillation, and higher pressure at period of peak load, in spite of a greater send-out of gas—179,700 c.ft.]

sirable, especially in these days of keen competition with electricity.

The plant requires little attention. Once a day I check the solution and temperatures, and regulate the evaporator by-pass—just a five minute job. Not until three months from starting was it necessary to dissolve a barrel of chloride to make up the bulk. Once only was there a hitch—early in November—when the solution solidified in the syphon overflow, due to a sudden frost catching us with the solution density a little too high; but two buckets of hot water soon cleared it.

The installation is fixed on the 10-in. outlet main from the holder, the absorber being a tower scrubber in which the gas is scrubbed with calcium chloride solution. The base of the tower forms a tank for the storage of the necessary quantity of a solution of calcium chloride. In addition to the absorber, there is a "Rack" cooler, consisting of galvanized iron pipes expanded into cast-iron headers and fitted with a water distributing trough.

Between the tower and cooler is situated a continuous evaporating apparatus consisting of an arrangement of cast-iron tubes, through which the exhaust steam from the pump is made to pass. A distributing trough above the evaporator is charged by a by-pass with the required amount of absorbent to be evaporated in order to keep up the density of the bulk. For the circulation through the cooler and tower and evaporator there is provided a suitable steam driven pump. The water extracted from the gas dilutes the circulating solution, and is removed by manipulating the evaporator each day so that the strength of the solution is kept between 70°-78° Twaddell, according to the time of the year.

How Gas Lighting Obviated Downdraughts in Doncaster Corn Exchange.

We are indebted to Mr. Robert Watson, Engineer and General Manager to the Doncaster Corporation Gas Department, for the following description of an interesting gas lighting installation in the Doncaster Corn Exchange Building.

The Corn Exchange, which is frequently used for meetings, concerts, and like functions, measures 80 ft. by 85 ft., and has seating accommodation for 1600. Discomfort has been experienced in this building due to its generally low temperature, and more particularly to the cold and unpleasant draughts from the roof.

Eight low-pressure water radiators have been added to the existing central heating installation, these being fixed on the north-east wall, where most of the cold winds impinge. The downdraughts are probably caused by the fact that air, although warm at floor level, rises, and, striking the cold roof, results in miniature storms and in downward currents. To overcome the latter trouble, six clusters of gas burners have been installed for the purpose of warming the surrounding air, and thus preventing the downward flow.

Each gas cluster consists of twenty small (No. 2) burners, and the clusters are suspended in two rows about 15 ft. below the roof principals and some 40 ft. above floor level. They are equipped with two distant control taps—one for each row of three clusters—fixed near the gallery doors. The taps permit of the gas being switched on and off without difficulty.

For cleaning purposes and renewal of mantles when required, each cluster is furnished with special gear consisting of a cylinder and piston joint, suspension cable, and a winch fastened on the side wall. By means of this gear, the pendant pipe and gas burner cluster can be detached and lowered to the ground, and subsequently raised to its proper position with automatic jointing.

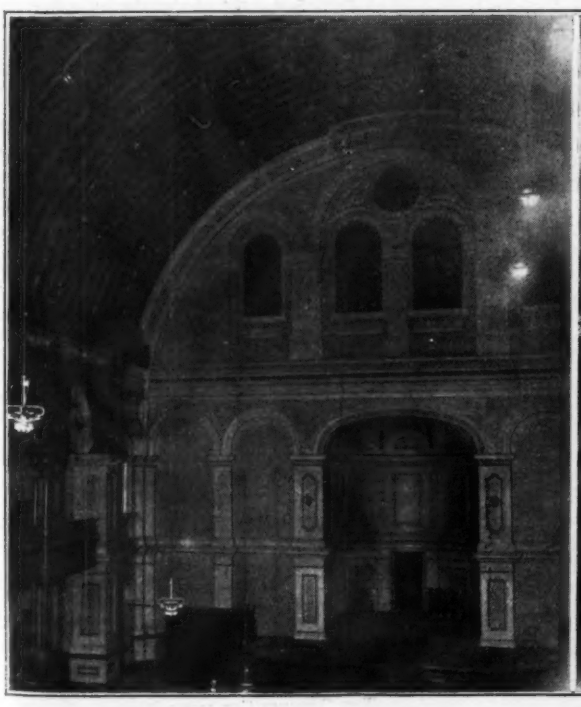
Each cluster lamp is provided with a small cup containing solidified methylated spirit. This is lighted and gives a flame lasting sufficiently long to permit of the re-ignition of the by-pass jet of the cluster when it is raised and reconnected. The six lamps yield light of approximately 6000 C.P., and together cost 1s. 7½d. per hour to run.

In order to test the efficacy of the gas installation for the avoidance of draughts, a maximum and minimum reading thermometer has been suspended some 8 ft. above the level of the cluster lamps. A number of experiments show that an increase in temperature of some 16° has been obtained, compared with an increase of 4° when the clusters were not used.

Toy balloons hung at the same height indicated a definite upward movement of the air. A similar balloon held on a silk thread well below the gas clusters, while tending upward, showed no perceptible side or other currents which might cause draughts. These tests appear to indicate that downward currents of cold air are avoided under the new conditions.

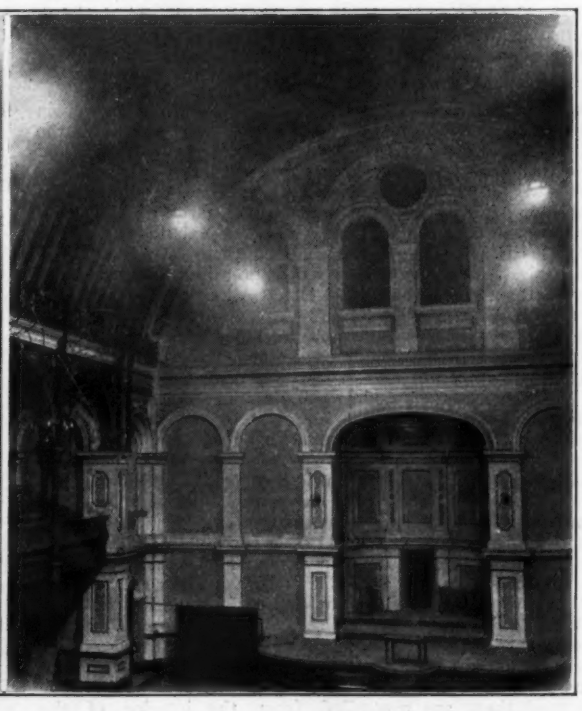
The combined effects of the gas clusters and of the radiators have been to increase the heat inside the hall to something approaching 68° with an average outside temperature.

Since these fittings have been introduced several functions have been held at the Corn Exchange, and considerable satisfaction has been expressed as to the result of the attention which has been given to the ventilation and heating. The "Doncaster Gazette" for March 14 paid tribute to the success of the scheme.



Three Clusters in Different Positions, showing Lowering and Lifting Method.

[The cable is carried to the side wall, where the winch is fixed.]



Photograph of the Interior of the Doncaster Corn Exchange taken by Gas Light.

[Note the two sharp shadows under the side gallery.]

New Showrooms for the Croydon Gas Company.

Splendid Premises in Wallington.

The Croydon Gas Company could hardly have chosen a better site for their finely proportioned new showrooms and stores than that on which the Wallington premises have been erected, and which were formally opened by Mr. A. E. Bennetts, J.P., the Chairman of the Beddington and Wallington Urban District Council, on Monday, March 17. Situated as they are on a corner position in a main road, they form a most imposing building, with the external design of a Spanish character, having white plastered walls and restrained carving to the window surrounds.

Among those present at the opening ceremony, besides Mr. and Mrs. Bennetts and daughters and the officials and various members of the Beddington and Wallington and Carshalton Urban District Councils, were Mr. William Cash, J.P., F.C.A. (Chairman of the Company), Mr. T. Rigby (Deputy-Chairman), Messrs. P. H. Hall, J.P., H. Williams, O.B.E., F.S.I., and H. Woodall, J.P., M.Inst.C.E. (Directors), and Mr. W. J. Sandeman, M.Inst.Gas E. (General Manager), Mr. W. Grogono, M.Inst.Gas E. (Engineer), Mr. F. F. Wood, A.C.I.S. (Secretary), Mr. W. A. Bishop, Assoc.M.Inst.Gas E. (Sales Superintendent), and other officials of the Company.

Description of Premises.

For some considerable time the original district showroom and depôt at Wallington proved inadequate to deal with the business of that busy and rapidly growing neighbourhood, and it was therefore found necessary to erect more commodious premises to facilitate local service. A corner site was purchased at the junction of the important thoroughfares of Woodcote Road and Stanley Park Road, and the existing building, formerly used as a school, was demolished.

The designs of the Company's new premises were prepared by Mr. A. Douglas Robinson, A.R.I.B.A., of 104, Queen Victoria Street, E.C. 4, and building operations commenced on March 25, 1929, the general contractor being Mr. E. H. Smith, of Wellesley Road, Croydon. The nature of the site demanded a bold corner entrance, and in order to meet this requirement axial treatment was adopted in the planning, thereby ensuring that a maximum view of the premises be obtained from all angles, and, at the same time, imparting a sense of " balance " to the whole building.

The total area of the showroom is 2940 sq. ft., and in arranging the lay out of the exhibits an effort has been made to demonstrate how modern gas appliances can be fitted to harmonize with both modern and old style surroundings.

The main lighting of the showroom is effected by Sugg's " Bon Marché " lamps, affixed to which are decorative drop crystals supplied and fitted by Mr. S. Lesofsky, and supplementary lighting is afforded by a selection of elegant candle-brackets, standard lamps, &c.; practically all these fittings being lighted and extinguished by means of distance controls. The external lighting of the premises is by means of " Rochester " lamps, and these are controlled from the interior of the building.

The main exhibits include a complete kitchen having three tiled and ventilated recesses, in which are installed (*a*) an elevated gas range, (*b*) an all-enamelled " New World " gas cooking stove with coke boiler adjacent, and (*c*) an all-gas kitchen, comprising cooking stove, circulating boiler, and gas fire. In addition, there are fitted in the kitchen a Clarkhill water-heater, " Sunhot " boiler and " Lyn " boiler. All these appliances are fitted to function, and they provide hot-water at various taps in the kitchen and bathroom above. A feature in the kitchen of special interest to the public is the gas-operated " Electrolux " refrigerator—the gas industry's latest contribution to domestic hygiene. Placed over the kitchen is a gallery in which is housed a bathroom exhibit, hot-water being supplied by the popular geyser, and, as stated, with alternate services from the gas and coke boilers below.

On the ground floor at the other end of the showroom is a tastefully furnished dining room which is heated by a large coke fire set in an ornamental stone recess, and above this dining room is a gallery equipped as a lounge, and here the heating is effected by means of a metal-sheathed gas fire.

Erected around the two main stanchions of the showroom are gas fire flues, and they are rendered complete with working exhibits by suitable tiled hearths and surrounds and bolection mouldings supplied by the Nautilus Fire Company. There is, also, fitted a very pleasant old-style fireplace in rough brick and tile, and in this fireplace there is installed a wrought-iron basket gas-fire, which admirably suits its surroundings. A point worthy of mention in connection with the gas fires which are fixed is that none of the connections is visible; they are all concealed underneath the floor. It has been the object to display as many fires as possible as they would appear in their actual surroundings, but those which are not so fitted are displayed on pylons.

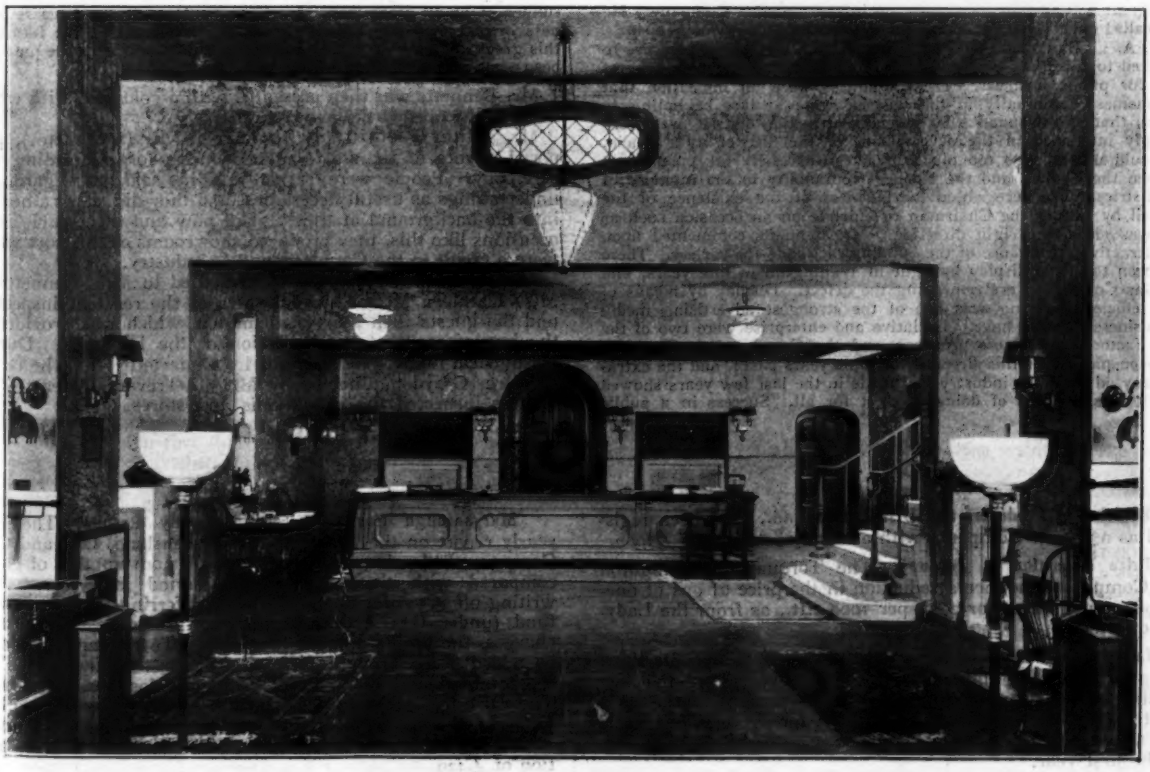
Cooking stoves are exhibited in the centre ranged against portable oak panelling, and another exhibit in the showroom is a chest of coke. At the rear of the building is the Inspectors' office, which connects with a well equipped and generous stores, below which is the fitters' workshops and mess room. Situated on the first floor of the premises is a Lecture Hall capable of accommodating 200 persons, and it is proposed to utilize this room for the purpose of holding cookery lectures and other demonstrations from time to time. The interior of the showroom is decoratively finished with textured walls and ceilings, metal grilles, gates, and lamps, and one interesting constructional feature is the provision of ventilated cavity ceilings, which ensure the maintenance of an even temperature throughout the interior of the building.

It is hoped that the erection of these new premises will enable the Company to afford the local public a better and more complete service, and that the facilities offered for the inspection of the most efficient gas appliances installed in their actual surroundings will be taken full advantage of.

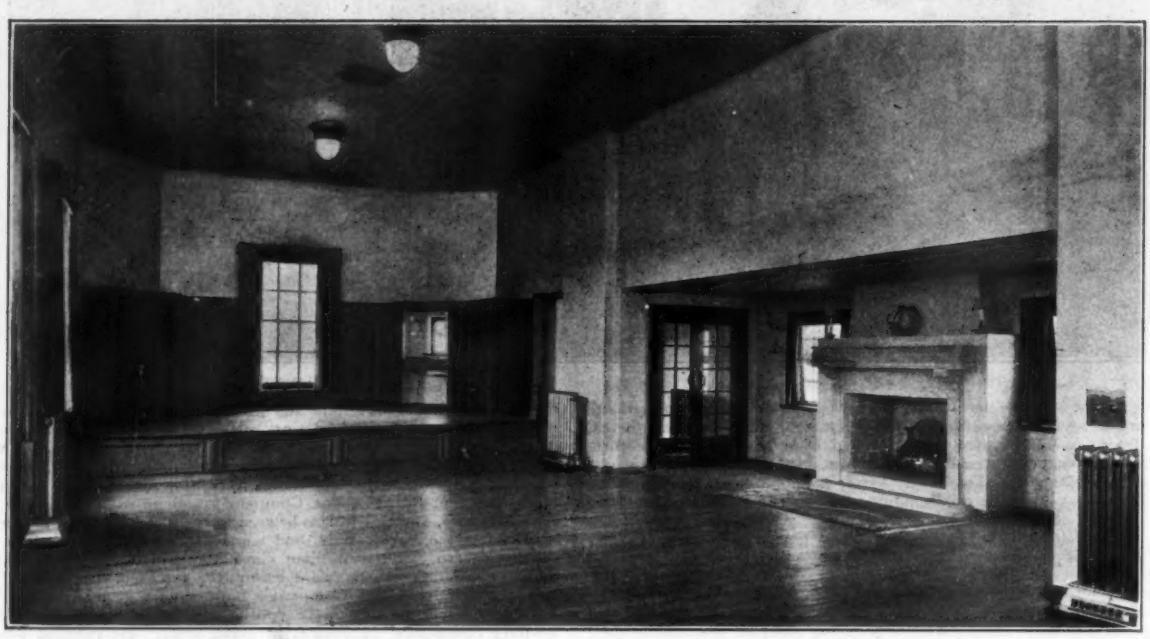
The Opening Ceremony.

Mr. W. Cash, J.P., F.C.A. (Chairman of the Gas Company), addressed a few remarks to a large gathering of guests prior to the

opening of the showrooms by Mr. Bennetts. It gave him very great pleasure, he said, on behalf of his co-Directors, to welcome them there that afternoon. These new premises had been erected to serve the Wallington area and to replace the present inadequate showrooms a little further down the same road. They had had this site available for some time, and really this building was considerably overdue. He would like to congratulate the architect, Mr. A. Douglas Robinson, for what he had done. The Company had a very definite policy in regard to their showrooms, and these premises were another step in the right direction. He could give them some indication of the amount of business done through these premises when he told them that over £70,000 worth of business had been carried out in stoves, fittings, &c., through their showrooms during the past year, while the orders dealt with by the district staff numbered over 170,000. The Croydon Company's motto was to try to please their consumers. That was more than half the battle when carrying on a business of this character. In this building, continued Mr. Cash, they hoped that people would come and see what could be done by gas in the way of both lighting and heating. Here also consumers could come and see what were the most economical types of appliances; what were the most efficient; and what were the most attractive. And he ventured to say that manufacturers were now making very attractive appliances and fittings. The Company could go even one stage further than that, and this was to be seen in their new workshops recently acquired in the Purley Way, and which his colleagues had done him the honour to call the William Cash Workshops. Here gas appliances of all descriptions were examined, repaired, and tested. He went on to refer to the Company's maintenance system, saying that a large number of men were continually going round the district keeping consumers' appliances in good order. He referred also to the rapid growth of the Company in recent years, saying that at the present time they had something like 70,000 stoves and cookers on hire on the district, which did not take into account those which were owned by consumers. They had to face considerable competi-



tion from electricity, but, as he had said before, there was room for both. During the last seven years the increase in the output of gas had been 23 p.ct., while the number of consumers had gone up by 46 p.ct. They were meeting there that day the chiefs of local authorities throughout their neighbourhood. The Company's relationship with the local authorities had always been good; in fact, their Secretary Mr. F. F. Wood, had previously been elected Chairman of the Beddington and Wallington Urban District Council. Referring to the progress of the Company, Mr. Cash said that when they took over the old Carshalton Gas Company in 1894 this area was very different. In that Company there were 645 consumers. To-day, on a round estimate, there were 14,500. That showed something of the enormous growth and development that had taken place in that area. They very much appreciated Mr. Bennetts' kindness in coming there to open their new showrooms. There were many ways whereby the Gas Company came into touch with the local authority, among which were the laying of mains in their roads, the paying of rates, and also in regard to street lighting. They were also associated with the various surrounding local authorities in connection with the testing of their gas, which was done by all the authorities jointly.



LECTURE AND DEMONSTRATION HALL OF THE NEW CROYDON SHOWROOMS.

Finally, Mr. Cash drew attention to the Company's Co-Partnership Scheme, representatives of which were present on that occasion. They were great believers in co-partnership in the Croydon Company. He then called upon Mr. Bennetts formally to declare the premises open.

Mr. A. E. Bennetts, J.P., said it gave him very great pleasure to be asked to carry out this ceremony of declaring the new showrooms open for public business. These premises were an indication that the business community in this district were at last beginning to realize that the Council which represented the district was very strongly interested in the development of the district as a whole. He could not enlarge too much upon the necessity for partnership between the Council and the business community in the interests of the district. The recognition by business of the existence of the Council by asking the Chairman to officiate on an occasion such as this was all in the right direction. Mr. Bennetts commented upon the attractive appearance of the building; it made for variety. There had been too little display by light in Wallington in late years, and the Gas Company were remedying the defect. Display by means of more efficient lighting was one of the strongest advertising media for business firms to have. Initiative and enterprise were two of the main factors in business progress, and the Croydon Gas Company had been pioneers in this direction for some years past; and the extraordinary advance the industry had made in the last few years showed that it was desirous of doing its best for all. Success in a public company such as this one could come only by efficient administration and executive, and in this case there had been co-ordination between the two branches of the organization. As far as he could see a very happy choice had been made in both. The co-partnership scheme which the Company had introduced, of course, made for success. He only wished that it was more general in industry throughout the country. For when a worker in an industry felt that the success of that industry depended upon his individual work, they would obtain the best results in that industry. They did not merely earn their wages or salary, but obtained something else from the additional success that came to the industry. Turning to the future of the gas industry, he stated that Wallington had a population of 25,000 people at the present time; but it was growing fast, and within the next ten years he ventured to think that they would have a population of 60,000. There was, therefore, hardly a house in the whole of the district which did not consume gas in one form or another. And with this potential increase of the population the output of gas should be doubled within the next ten years. The Council was a large consumer, continued Mr. Bennetts, not only of gas but of tar for their roads, while gardeners also used sulphate of ammonia. He was thankful that the Company had associated the Council with industry in this way, and hoped that this would merely be the forerunner of many other ways in which the Council could assist business in that district. Finally, he sincerely hoped that the future of this great undertaking would not be merely as bright as the past had been—but much brighter.

Mr. Bennetts was then presented with a gold key, with which he formally opened the showrooms.

Mr. Henry Woodall, J.P., M.Inst.C.E. (a Director), proposed a vote of thanks to Mr. Bennetts for performing this ceremony. People were rather apt, he said, to regard gas undertakings as useful necessities, and they did thus rather get into the background at times. But now and then, such as on occasions like this, they produced showrooms of this sort which were a credit to the Company and to industry.

At this stage a bouquet was presented to Mrs. Bennetts by Miss Kathleen McCarthy, daughter of the resident inspector; and the guests then adjourned for tea, which was provided in the lecture room at the invitation of the Directors. During tea musical items were rendered by a quartette from the Grand Theatre, Croydon, directed by Mr. L. Trevor. After tea the visitors inspected the showrooms and stores.

British Tar Producers and Distributors, Ltd., have been registered as a private Company, with a nominal capital of £1000.

Price Reduction at Torquay.—The Torquay and Paignton Gas Company announce a reduction in the price of gas of one-halfpenny per therm, or 2·4d. per 1000 c.ft., as from the Lady-day quarter.

Lurgan Gas Profits.—Lurgan (Co. Armagh) gas profits show a big drop for the last year. It was reported at the last meeting of the Urban Council on the gas account there was a profit of £42 as compared with £1893 for the previous year. The new electric undertaking showed a profit of £168 7s. 4d. on the first year.

Maryborough Gas and Coke Company Results.—The half-yearly report on the Maryborough (Queensland) Gas and Coke Company, Ltd., shows a decrease in the consumption of gas as compared with the corresponding period last year. After writing off £500 for depreciation, transferring £206 to reserve fund (under Gas Act), and making provision for all other charges, the profits amount to £1465. To this amount has to be added £407 brought forward from last half-year, making the total amount at credit of profit and loss account £1872. The Directors recommend that this amount be dealt with as follows: By the payment of a dividend of 7 p.ct. per annum, which will leave a balance to be carried forward to meet taxation of £429.

Presidential Address of Mr. W. J. Smith, B.Sc., of Bolton.

[Manchester District Institution of Gas Engineers, March 25.]

The Manchester District Institution of Gas Engineers was founded sixty years ago, and this year celebrates its Diamond Jubilee. During this period the Institution has numbered among its Presidents many men who have contributed in no mean way to the advancement of the gas industry. We have only to remember such names as Newbigging, Carr, Wood, and West—mentioning only a few of the outstanding men—to appreciate fully the high standard set by my predecessors in the chair.

I feel it an honour and a privilege to be elected as President for this year, constituting as it does a milestone in the history of the Institution. Bearing in mind the high standard set by my predecessors, it will be my earnest endeavour to maintain the splendid traditions of our Institution.

It is not my intention to dwell upon the history of the Institution, as this was ably set out in 1920 in a pamphlet entitled "Notes on Fifty Years' Work." Further material is being collected which will bring this pamphlet up to date. Despite many difficulties and much competition from oil, coke oven coke, low-temperature carbonization, and electricity, it is pleasing to note the steady progress of the gas industry. We regret the unfair nature of some of the competition with which we are faced; we can, however, take comfort from the fact that the use of gas has increased year by year, and is still increasing.

Competition has stimulated us to greater effort, and to-day the output of gas undertakings, calculated as B.Th.U., is far in advance of the output of electricity undertakings, in spite of the many statutory privileges enjoyed by the latter. These privileges include high maximum price per unit and high minimum charge per quarter with no supervision as to quality. The gas industry, on the other hand, is subject to low maximum price and no minimum charge, with a keen supervision by the Gas Referees. The consumer of electricity may, however, be subject to considerable variations in voltage which act detrimentally upon his apparatus, especially lamps, causing expensive renewals.

Let me as an example state the position in Bolton during the last financial year.

Electricity statutory maximum price per unit	8d.
Minimum charge per quarter	7s. 6d.
Total inclusive cost per unit for electricity .	0·913d.

That is to say, the electricity undertaking can charge 776 p.ct. above the inclusive cost, with a further safeguard of a minimum charge of 7s. 6d. per quarter—or, in other words, the electricity undertaking is secured against loss from individual consumers.

The following table shows the results obtained:

—	Units Sold.	Average Price Obtained.	Total.		
		d.	£	s.	d.
Private lighting	4,383,132	3·93	71,773	15	8
Combined lighting and heating . .	4,451,968	1·90	35,244	14	11
Public lighting	72,146	1·24	372	15	1
Power	49,263,481	0·77	158,053	13	4
Tramways.	7,951,269	1·15	38,099	16	7

Giving an average price of 1·10d. for a total sale of 66,121,996 units.

Statutory maximum per therm—gas . . .	9·6d.
Total inclusive cost per therm—gas . . .	8·4d.

That is to say, the statutory maximum is 14·3 p.ct. above the actual total cost for 1929.

The equivalent statutory maximum for electricity would be 1·043d.

These privileges enjoyed by the electricity industry, in my opinion, permit of unfair competition, and the time has arrived—in fact, is long since past—when the gas undertakings of this country should be permitted to enjoy equal freedom of action.

It is an undoubted fact that under existing statutory obligations gas undertakings throughout the country have to sell gas to a large number of consumers at a loss, and so are faced with the necessity of charging other consumers more than their fair share of the cost.

Cost of Coal.

One turns with some misgiving to the net cost of coal. The time was when the residual market was such as to leave net coal at a low figure; and in some notable cases, such as Widnes, under the direction of the late Mr. Isaac Carr, actually a *minus* quantity. Compare this with the present condition of affairs. Ammoniacal liquor no longer brings in 3d. per 1000 c.ft. of gas sold, but is in some cases a liability. Tar, under the influence of co-operative schemes, certainly for a time gave a useful return, but this has been greatly reduced owing to the influence of Continental markets and foreign bitumen on the sale of road preparations. There are, however, signs of an improvement in this direction, in which the British Road Tar Association is playing an important part.

The industry is faced with an attempt to force up the price of coal to the gas industry without a corresponding increase to the domestic user of coal, and probably without a corresponding increase to the coke oven industry, which already enjoys the advantage of a lower rate of wages than that paid by gas undertakings, and, further, comes within the De-Rating Scheme. This will tend to increase the competition in our coke market.

Clean Coke.

It would seem, therefore, that we are faced with a possible reduction in the return from residuals, along with greater competition from household coal and coke oven coke. We must look to the quality of our coke, and bear in mind that the housewife will not accept a high ash and moisture content. Either pressure must be brought to bear upon the colliery proprietor to clean his product suitably, or the gas industry will have to devise means of further cleaning the coal received. The cost of this should not offer great difficulty, as the resulting coke ought to have an increased value.

THE PRESIDENT,

W. J. Smith, B.Sc.

Mr. Smith graduated at the Victoria University, Manchester, and was appointed Assistant Manager to the Bolton Corporation Gas Undertaking in 1897. In 1902 he left to take up the position of Engineer and Manager to the Carlisle Gas Undertaking, but returned to Bolton seven years later as Gas Engineer and Manager to the Bolton Corporation. He is a Member of the Council of the Institution of Gas Engineers, and at present Chairman of the Board of Examiners of the Gas Education Committee of the Institution. He is also a Member of the Central Executive Board of the National Gas Council.

In the past there has been a ready market for coke, irrespective of the domestic market. But with the growing demand for a cleaner atmosphere in our towns, a market is growing for a suitable smokeless domestic fuel. It is of the greatest possible interest to the gas undertakings to secure this market, inasmuch as the production of a smokeless fuel entails the production of a certain amount of gas. If the production of such material is in the hands of interests outside the gas industry, such interests will become a competitor for both gas and coke.

Up to the present time, low-temperature carbonization has not been a financial success, and in consequence competition from this source has not been felt to any great extent. But it is up to the gas industry to see that the development of smokeless fuel takes place within the industry itself. From experiments I have made, I am satisfied that coke suitable for the

domestic grate can be produced even with high-temperature carbonization.

Research.

This brings me to the question of research—research in the direction of improved methods of gas manufacture, in variations of the type of residuals made, and in the methods of marketing and selling gas and its bye-products.

Much useful work is at present being done at the Leeds University under the auspices of the Institution of Gas Engineers, and at the Fuel Research Station at Greenwich; but it behoves any works which is able to do so to carry out investigations of its own on a larger scale than those at the above places, for the benefit both of its own trade and of the industry in general. Many works, as you are no doubt aware, do carry out such research. We at Bolton are interested in such work, and are carrying out original research on our own account. I would like here to mention the methods we adopt for such work, and indicate some of the results obtained.

We have a fairly ambitious test plant consisting of condensing, exhausting, washing, scrubbing, and purifying plant capable of dealing with about 300,000 c.ft. of gas per day. This is connected by a 6-in. foul main to a seal pot fixed adjacent to two retorts in a setting of 36 5-ton Woodall-Duckham retorts. Additional offtake pipes have been fitted to the retorts in question, connecting them to the auxiliary seal pot. Gas can be taken from these retorts either to the setting foul main, or to the test plant auxiliary seal pot. The gas passes through meters and a small test holder of about 5000 c.ft. capacity, and then into the main works foul main. The coal to the retorts and coke to the producers can be weighed on an Avery automatic weighbridge fitted on rails over the coal and coke bunkers to the bed. Arrangements have been made for weighing coke extracted and measuring tar and liquor made. All materials, including gas, are sampled. The latter is sampled in a special average sampler which draws purified gas from the main at a constant rate, and can be set to take a sample over any predetermined period. All gas analyses are taken on a Bone & Wheeler apparatus. A Fairweather recording calorimeter is provided to indicate and record the calorific value throughout all tests.

For certain special work it has been necessary to instal a recording orifice type meter to show variations in the rate of gas made. For this purpose a Bailey meter was adapted, and a series of special orifices were calibrated to give a wide range of rates of flow. Retort temperatures are taken, in common with our standard practice, using a disappearing filament pyrometer, which is frequently checked against a standard instrument. Full-scale test runs on any type of coal, or any variation of methods of manufacture may be carried out. Test runs are made over periods varying from one or two days to a week or more.

Since these tests are carried out on a commercial scale with the ordinary shift workmen under strict technical supervision, the results are of immediate value, and do not require to be translated into practical politics as do those from a small-scale experimental plant. The technical assistant in charge carries out all running tests and gas analyses, coal, coke, tar and liquor samples being dealt with in the laboratory.

As the two test retorts form part of the main setting, there is no loss of carbonizing capacity when testing is not in operation. Further, testing can be carried out at irregular intervals and at short notice without inconvenience; this would not obtain if a separate test retort unit were employed. In case of emergency, the test retorts can be swung over to the setting foul main, and the test plant shut down in under five minutes. Much useful work has been done on these lines, and valuable information obtained. Work on various types of coal, and their behaviour in vertical retorts, has modified our general carbonizing practice and given us useful data in contracting for our coal requirements. The results from the test plant qualify the laboratory tests and make these more valuable.

Examination of the coke made under varying conditions of carbonization and from various types of coal has shown the possibility of making cokes of varying reactivity. This indicates that it will be possible to supply cokes to meet the different needs of our various consumers. In my opinion, by suitable methods of carbonization, such cokes can be produced. Our work up to the present has shown us that the production of useful cokes does not need to interfere with the efficiency of gas manufacture. In many cases we have noticed that big improvements in this direction take place simultaneously with an improvement in coke. While speaking of coke, I may mention that the cokes are being tested both by actual observation on the fire, and also in the laboratory by well-established tests for reactivity, &c. Such work of necessity takes up considerable time, but it has repeatedly proved its value to us. Often a research started with one object in view has shown some other fact or method of importance. As an example of this work, I would like to quote some tests we were carrying out at the commencement of the last coal strike.

Tests Prior to the Coal Strike.

We were investigating on our test plant, along with Messrs. Woodall-Duckham, the manufacture of blue water gas in vertical retorts. Our work revealed that, with suitable care in manipulation, such a process was possible, and could under certain market conditions be put to profitable use. The occasion for trial on the large scale arrived opportunely with the coal strike. During the major portion of the time this was in progress we made a large quantity of blue water gas, first at our Lum Street Station, and later at our Gas Street Station, where we had 25 p.ct. of our retorts at work on blue water gas. The advantages are reflected in the returns for that year.

Taking seventeen surrounding towns and adjusting the price charged per 1000 c.ft. against surplus or deficit on the year's working, there is a figure of 11·51d. per 1000 c.ft. in favour of Bolton compared with the average of these seventeen towns.

Where the results from the test plant have warranted further investigations on a still larger scale, a full test run for a period of a week or longer has been carried out on a whole setting working under the conditions suggested by the smaller tests. All materials and products have been weighed or measured, samples taken and analyzed, and a full cost sheet for the process prepared for comparison with normal practice. This is only some indication of the work done. Many problems have been, and are at present, under investigation. Among these I would mention a few.

Sulphate of ammonia effluent liquors have occupied our attention for a considerable time, resulting in some modification of our process of scrubbing the gas so as to obtain a liquor with a lower oxygen absorption figure; and later in the introduction of dephenolating towers and a modified system of distillation.

The effect of steam on furnaces, in place of the more usual water feed to the bars, has been examined, and the use of the pyrometer in exploring furnace temperatures has shown the more even temperature throughout the fuel bed which is possible when using steam.

We now use steam and steam-injected air to all producers, keeping the doors closed, and we get a very marked improvement in furnace conditions, such as absence of clinker, less free carbon in ashes, and more regular running of the furnace and setting heating arrangements generally.

Difficulties arising out of oxide purification have been examined from time to time, and the working altered in accordance with the findings. Perhaps at some later date I may be in a position to give further details of work at present in hand.

Recent Extensions of the Bolton Plant.

As during the past few years considerable alterations and extensions have been made to the Bolton plant, I propose to add a brief description of the work carried out. Also, in accordance with the suggestions put forward by the "Gas World," I include costings where I think they will be of interest to our members.

In 1872 the Bolton Corporation took over the gas undertaking from the Bolton Company, the annual consumption at that time being 300 million c.ft. The consumption of gas has shown a steady increase up to date, the output for the last financial year being 1266 millions.

In 1888 the consumption was 500 millions, and the two existing stations were considered to be on their maximum load. A Consulting Engineer was called in to advise as to future extensions, and ground was purchased on which it was decided to build a new works. A new Engineer was appointed in the person of my father, Mr. Wm. Smith, and under his direction the existing works were re-organized, and continued to give the full supply required by Bolton up to about 1927. The ground purchased for new works and which was then no longer required was ultimately sold to the "Bolton Wanderers" for use as a football ground.

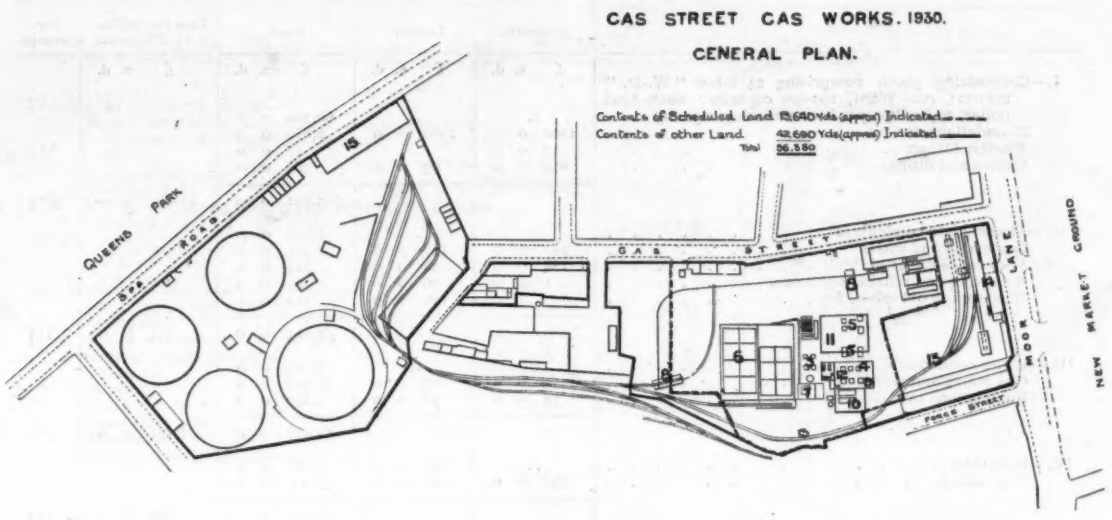
In 1924 the then existing plant was on maximum load; the nominal capacity of the plant was 5 million c.ft. per day, and the maximum day's output was 6,094,000 c.ft. While the carbonizing plant handled the load, it offered no provision for the necessary repairs, and no surplus to meet future increase.

The existing No. 1 unit at Gas Street Works comprised a recent installation of Woodall-Duckham vertical retorts, and a subsidiary plant which was inadequate. The condensing and washing plant, the exhausters and generators, and the coke plant had been in service for many years, and were working well above their normal capacities, while the boiler plant was in need of renewal. This No. 1 unit was therefore to be remodelled in so far as new pieces of plant were necessary, and re-arranged to accommodate the No. 2 unit, taking into consideration the relatively small area of scheduled ground available. The accompanying sketch illustrates the general lay-out of the two units as completed.

The old horizontal retort bench was demolished and the roof of the retort house removed, the site forming a coke storage yard.

New sections were erected to No. 1 unit comprising atmospheric and water condensers, exhausters, generators, extensions to Livesey washer, tar and liquor wells, station meter, and Lancashire boiler. These sections were coupled up to a re-arranged gas pipe line in such a manner as to make the full unit independent of the new unit to be installed, and yet capable of coupling up to the same in sections.

New telpherage, coke bunkers, machinery, pump and boiler



house were erected to satisfy the requirements of both units combined, with a probable third unit at some future date.

Gas-making at the Gas Street Works could be stopped for a limited period during the summer, and the designs of the plant and buildings were made to take advantage of such periods.

The re-modelling of the No. 1 unit was commenced in April, 1924; and from April, 1925, to October, 1925, the existing telpherage, exhausters, generators, and buildings were demolished, and new buildings and plant installed. Later No. 2 unit was proceeded with, and completed ready for gas-making in February, 1928.

PLANT COMPRISING NO. 2 UNIT.

A brief description of the sections of plant comprising No. 2 unit is given below. Each section of the plant was costed out separately, and these figures are appended for your information. The numbers against the paragraphs correspond with the numbers on the sketch plan and those on the costing sheet.

(I.) The carbonizing plant of No. 2 unit comprises twenty-four 8-ton Woodall-Duckham silica retorts with 48 hours' supply overhead coal bunkers and an outside battery of five step-grate producers. The coal handling plant consists of a 100 tons per hour lipped bucket Babcock & Wilcox gravity bucket conveyor, and a Jeffrey type single-roll breaker, with rotating wagon tippler and 40-ton receiving hopper. A new waste-heat multitubular type boiler of 12,000 lbs. per hour steaming capacity is fitted, and a system of thermo-couples is arranged to show boiler temperatures, and is connected to a recording instrument fixed in the laboratory. The coke from the setting is handled by electrically-propelled trucks coupling up both units to the telpherage. An auxiliary 50 tons per hour coal plant of belt conveyors is arranged to interconnect the main coal handling plants of the two units. The foundations for the retort bench comprise forty-two 14-in. square by 27 ft. long reinforced concrete piles braced and framed at the head. The remaining foundations and crusher pit were executed by direct labour under the supervision of the works staff.

(II.) The atmospheric condensers were built up of eighteen new annular tubes erected on three sets of existing cast-iron boxes, and the foundations are formed of concrete piers supported on steel joists encased in concrete, which span the roof of an existing old well and rest upon the well walls. The annular tubes are formed of steel plates with welded butt joints throughout. Our experience has been that the welded butt joints show a decided advantage over the old riveted joints formed with butt straps, which offered ledges for holding water, with consequent rusting of the plates at these points, despite an annual coat of plant.

(III.) Two vertical water-tube condensers by Messrs. R. & J. Dempster, Ltd., are provided, each comprising 262 3-in. outside diameter tubes 21 ft. long, with top and bottom water chambers. The condensers are arranged to operate either singly or in series, the water is contra-flow, and the exit water passes by gravity to the overhead boiler feed water tank. The condensers are supported on a square concrete hollow pier carried on steel joists, encased in concrete, which span the roof of the old well and rest on the side walls.

(IV.) The exhausters are of the Reavell diffuser blade type directly coupled to Brotherhood steam turbines, and each of the three exhausters can operate on either of the two units of plant. Difficulties were experienced with these sets in the early days. The defects, individually minor in character, have been largely eliminated, and the closed bell type governor actuating the steam to the turbine has been fitted with a special air vent which tends to maintain a more even vacuum.

In No. 2 retort house four "Askania" oil relay governors with butterfly valves are employed to maintain suitable pressure conditions on the retorts. Regular changes of the oil filters are necessary owing to the infiltration of dirt and dust into the system. In No. 1 retort house two "Arca" relay governors operated by water pressure have been introduced, and control the valves to the two existing bell type governors. The town's water supply, however, brought out another feature; spores accumulated very rapidly in the regulator itself, and in a short length of the pipeline, which soon prevented the governors from operating. A special set of flushing valves and damping holes has been attached, and continuous working is now maintained with a minimum of trouble. The two types of governors are giving equally satisfactory results as regards the maintenance of the regular pressure conditions in the retorts.

(V.) The wet purification plant comprises a standard 3-million Livesey washer and a standard 3-million steam-driven rotary scrubber manufactured by Messrs. R. & J. Dempster, Ltd., of Manchester. The two pieces of plant are erected on the roof of the new wells, and simple foundations to spread the weight evenly are all that have been necessary.

(VI.) The purifiers comprise eight cast-iron boxes, each 30 ft. by 30 ft. by 6 ft. deep with two layers of grids and rubber luted steel lids secured by cotter pins. The boxes are arranged in fours each fitted with internal Wecks valves. In addition, external rack and pinion valves are fixed in the pipe line to enable each set of four boxes to be by-passed if desired. Gas can be passed upward or downward in the first set of four boxes. A 15-ton variable speed oxide breaker with a 20-ton bucket elevator handles the oxide from the ground floor to the overhead floor.

The purifier house is of steel framed construction encased in concrete and consists of a ground floor and a purifier box floor over which a system of girders span and into which a revivifying floor and roof have been introduced. The corrosion of the steelwork in the existing house was such as to necessitate the substitution of the existing steel roof trusses by girders similar to those on the new house.

The foundations of the existing house were underpinned, without disturbing the existing boxes which were in operation, and grillages inserted. The side stanchions were strengthened to carry the extra loads while the internal row of stanchions were made to serve for the new house.

Two sets of heaters have been applied to the eight boxes which permit of suitable temperature control on the boxes themselves. The heaters were designed and manufactured in our own workshops.

(VII.) The two small station meters on the No. 1 unit had been dismantled, and a new 150,000 station meter installed in the same house which could not accommodate a second meter of the same type. Two new Bailey recording gas meters were therefore added, and the pipe line arranged so as to enable the station meter to be operated on either unit and to act as a standard for the Bailey meters.

(VIII.) The coke for the two retort houses is brought to a common point where a 3-ton telpher handles the skips. The overhead track is constructed of steel girders approximately 100 ft. span with a total length of 550 ft., and is supported on steel lattice stanchions 50 ft. high. These stanchions were constructed of steel on account of the very limited time at our disposal for the dismantling of the existing coke plant and the erection of the new plant. The steel has been protected by concrete after the new plant was working. The rail bunkers have a capacity of 120 tons, and the road bunkers 80 tons, and each set is fitted with a rotary screen giving four grades of coke. An overhead repair cabin and traversing house is attached to the retort house end of the track and is large enough to house the two telpher machines. The foundations of the

—	Materials. £ s. d.	Labour. £ s. d.	Total £ s. d.	Cost per Million C.Ft. (Nominal). £ s. d.	Per-centage.
I.—Carbonizing plant, comprising 24 8-ton "W.-D." retorts; coal plant, 100-ton capacity; waste-heat boiler, 12,000 lbs. per hour steaming capacity	..	..	60,300 0 0		
Foundations and pit	1200 0 0	1680 0 0	2,880 0 0		
Electric fittings	47 0 0	..	47 0 0		
Cables and fittings	271 0 0	93 0 0	364 0 0		
			£63,591 0 0	21,197 0 0	36·4
II.—Atmospheric condensers	..	..	1,605 0 0		
Gas mains and valves	230 0 0	127 0 0	357 0 0		
Foundations over old well	126 0 0	98 0 0	224 0 0		
Removing and refixing old boxes	1 0 0	26 0 0	27 0 0		
Dismantling old tubes, &c.	..	110 0 0	110 0 0		
			£2,323 0 0	774 0 0	1·3
III.—Water condensers	..	..	3,066 0 0		
Gas mains and valves	230 0 0	127 0 0	357 0 0		
Foundations over old well	78 0 0	71 0 0	149 0 0		
			£3,572 0 0	1,191 0 0	2·1
IV.—Exhauster	..	866 0 0	866 0 0		
Gas mains	668 0 0	262 0 0	930 0 0		
			£1,796 0 0	599 0 0	1·0
V.—Livesey washer. Nominal 3 million size, 15 ft. by 10 ft. by 5 ft. washer	..	..	690 0 0		
Foundations partly in tar and liquor wells	15 0 0	31 0 0	46 0 0		
Gas mains and valves	307 0 0	155 0 0	462 0 0		
			£1,198 0 0	399 0 0	0·7
Va.—Rotary scrubber. Nominal 3 million size, with steam, engine, scrubber, and engine	..	..	2,683 0 0		
Foundations in tar and liquor wells	11 0 0	11 0 0	22 0 0		
Gas mains and valves	182 0 0	93 0 0	275 0 0		
			£2,980 0 0	993 0 0	1·7
VI.—Purifiers. 8 boxes, tackle, lids, 20-ton bucket, elevator, and 15-ton variable oxide breaker	..	..	13,041 0 0		
Steel-framed house with ground floor, purifier box floor, revivifying floor, and roof—66 ft. by 135 ft. by 40 ft. high	..	..	5,262 0 0		
Concrete casing to steelwork	..	..	6,312 0 0		
Foundations and grillage joists	520 0 0	200 0 0	720 0 0		
Ground floor concrete and drains	320 0 0	250 0 0	570 0 0		
Gas mains and valves	573 0 0	318 0 0	891 0 0		
Water service	154 0 0	192 0 0	346 0 0		
			£27,142 0 0	9,047 0 0	15·6
VII.—Meter. Bailey recording meter and connections	..	..	330 0 0	110 0 0	0·2
VIII.—Coke plant comprising—					
2 3-ton travelling telpher machines	..	..	3,025 0 0		
1 set of overhead track 5 sets of steel lattice stanchions	..	..	4,326 0 0		
5 sets of steel lattice stanchions encased in concrete	450 0 0	580 0 0	1,030 0 0		
1 rail bunkers and screens	..	..	2,305 0 0		
1 road ,, ,, ,,	..	..	1,959 0 0		
1 overhead repair cabin and traversing house	..	..	1,455 0 0		
Foundations	220 0 0	540 0 0	760 0 0		
			£14,860 0 0	4,953 0 0	8·6
IX.—Power plant. One turbo-generator	..	..	831 0 0		
Switch panel	..	..	56 0 0		
			£887 0 0	296 0 0	0·5
X.—Boiler plant. One Lancashire boiler with setting, steel chimney, feed heater, and pumps	..	..	3,160 0 0		
Foundations	146 0 0	102 0 0	248 0 0		
			£3,408 0 0	1,136 0 0	2·0
XI.—Tar and liquor wells—					
Excavations	161 0 0	720 0 0	881 0 0		
Steelwork	471 0 0	240 0 0	711 0 0		
Timbering	397 0 0	261 0 0	658 0 0		
Concrete	778 0 0	471 0 0	1,249 0 0		
Brickwork	754 0 0	660 0 0	1,414 0 0		
			£4,913 0 0	1,638 0 0	3·0
XII.—Machinery house—					
General building work	..	..	8,430 0 0		
Steelwork	..	..	3,328 0 0		
4 cast-iron tanks	..	..	1,182 0 0		
Steam main	..	..	2,542 0 0		
Engine beds	960 0 0	600 0 0	1,560 0 0		
Dismantling existing pipes	1 0 0	93 0 0	94 0 0		
Electric wiring and cables	363 0 0	125 0 0	488 0 0		
Water, tar, and liquor pipes	444 0 0	143 0 0	587 0 0		
Gas mains and run-offs	443 0 0	151 0 0	594 0 0		
			£18,805 0 0	6,268 0 0	11·1
XIII.—Railway sidings, &c.—					
One new locomotive	..	..	1,638 0 0		
New railway lines, points, and crossings	595 0 0	510 0 0	1,105 0 0		
Loco. shed	..	..	345 0 0		
Foundations and excavations	3 0 0	87 0 0	90 0 0		
			£3,178 0 0	1,059 0 0	1·8
			Carried forward	£49,660 0 0	86·0

—	Materials.	Labour.	Total.	Cost per Million C.Ft. (Nominal).	Per-centage.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
XIV.—Repair shops and offices—			*Brought forward*	£49,660 0 0	86·0
Stores, mechanics', electricians', and joiners' shops, mess room, drawing office, laboratory, and general office	..	..	8,503 0 0		
20-ton weighbridge	..	..	375 0 0		
Machine tools	528 0 0	..	528 0 0		
Fitting new tools, removal and refixing old fixtures and plant	..	1277 0 0	1,277 0 0		
			£10,683 0 0	3,561 0 0	6·1
XV.—Workshops, Spa Road—					
Clearing site and excavations	142 14 3	450 17 6	593 11 9		
Foundations	114 19 6½	164 17 10	279 17 4½		
Drains and sewers	78 10 0	39 1 8½	117 11 8½		
General building contract	6956 17 6	16 19 9½	6,973 17 3½		
Steelwork	2026 16 9	..	2,026 16 9		
Heating	282 15 0	0 4 8	282 19 8		
Hoist	670 0 0	42 5 0½	712 5 0½		
Gas lighting, &c.	..	..	733 17 0		
Machinery	..	..	216 17 7		
Internal fittings and painting	..	..	1,258 3 6		
			£13,195 17 8	4,399 0 0	7·7
			Total . . .	£57,620 0 0	100·0

telpher track columns are of massed concrete of size sufficient to spread the load and to prevent uplift due to wind pressure.

(IX.) The electric generating plant comprises a 65-KW. Laurence-Scott high-speed generator unit direct-coupled to a Brotherhood steam turbine running at 3000 r.p.m.. The main switch panel is adjacent to the machines and is common to the three machines, and separate cables couple each of the principal motors on the works to the switchboard.

(X.) The auxiliary steam plant consists of a John Thompson 3-flue Lancashire boiler 9 ft. 3 in. diameter by 27 ft. long of 10,000 lbs. per hour steaming capacity and is complete with steel chimney, feed water heater, superheater, and pump. The boiler furnace is of forced-draught "Wilton" type, hand-fired and operating on coke breeze.

(XI.) The tar and liquor wells comprise two compartments each 20 ft. deep by 30 ft. by 40 ft., and are constructed in reinforced concrete with brick lining with the roof designed to support the wet purification plant. The design and construction of these wells were carried out by the gas-works staff with direct labour. A further two wells of the same construction were provided for the No. 1 unit, and we have now sufficient storage capacity for a third unit when required.

(XII.) The machinery house is erected on the site of the old house which accommodated the boilers, exhausters, and pumps for one unit; the ground area now covered is slightly larger; but in the new building the exhausters, generators, pumping and boiler plant for two units are comfortably housed with space provided for a possible No. 3 unit and a compressing plant. In addition, the roof is arranged to carry five large overhead storage tanks, and underneath a portion of the building a cellar is provided which gives easy access to the pipe services. The building is of steel-framed construction encased in concrete, which system was adopted for speed in erection within a six-months summer period. The old buildings were dismantled, and part of the new structure erected upon which the gas mains and exhausters were fixed; then gas making was proceeded with, and later the roof and remainder of the building was completed.

The exhauster and power house is 45 ft. by 77 ft. and is provided with a pitched centre roof for ventilation purposes and two flat side roofs carrying enclosed tar and liquor tanks each 11 ft. by 40 ft. by 4 ft. deep. The pump house is 38 ft. by 22 ft. with a flat roof; and the boiler house is 45 ft. by 60 ft. with a flat roof carrying two open water tanks each 36 ft. by 22 ft. by 4 ft. deep with a settling tank for rain water.

(XIII.) The coal to the No. 1 unit was brought up by a single-line track from the railway sidings, and, in order to handle the extra tonnage of coal for the No. 2 unit, a second line at the retort house end was necessary; but, in addition, a third line was included so as to enable a train of six wagons to be operated at the crushers instead of single wagons. An additional tank locomotive was provided, and a corrugated sheeting locomotive shed was erected on a branch line near the repair shop.

(XIV.) The boundary wall in Gas Street and Moor Lane was more or less of patchwork construction, and as the land in front of the works had been scheduled for town's improvements, it was considered essential that the front view of the works should have some æsthetic features. The works repair shops and offices were therefore arranged to be included in one building which should face Moor Lane and fulfil the double purpose. The building is of two storeys with a flat roof and covers a ground space of 27 ft. by 164 ft. The main gateway and weighbridge pass through the centre of the building, the room above the archway being the drawing office. On one side of the archway the ground floor is taken up by the mechanics' shop and smithy. The electricians' and joiners' shops are placed above the machine shop. The ground floor on the other side of the entrance is occupied by the works general offices and the works storeroom; while above these are the laboratory, the foreman's room, and the workmen's mess room. All the second floor compartments are separate and are entered by outside concrete stairways, with the exception of the laboratory and the drawing office which are made accessible by an inside staircase at the main entrance.

(XV.) The fittings and distribution department workshops at Spa Road is a three-storey building 40 ft. wide by 170 ft. long. The building is of steel-framed construction with brickwork panels. A patent stone ornamental frontage is bonded into the main structure.

The building houses the Government meter testing station, men's mess room, mains offices and stores, fittings offices and stores on the ground floor. The first floor is divided into two portions; in one the fittings large stores are kept, while in the other portion the fittings repair work is carried out. On the second floor the meter repair shops and our own meter testing station are placed.

Previous to the erection of this building the various departments were housed in five different buildings at various parts of the town. Bringing all these departments under one roof has reduced transport costs, and made efficient supervision possible. In conjunction with the fittings department we have an emergency service for dealing with distribution troubles at night. Garages for all our motor vehicles have been erected adjacent to the fittings department, and a repair garage with a maintenance mechanic is provided.

Cheaper Gas for Haltwhistle.—The Haltwhistle Gas Company have reduced the price of gas from 4s. 2d. to 4s. per 1000 c.ft., to take effect subsequent to the reading of the meters for the March quarter.

Proposed New Pressure Holder for Skipton.—The Skipton Urban District Council have approved a Gas Committee proposal to seek powers to erect a gasholder, at an estimated cost of £14,000, for storage of gas under pressure. The proposed holder will be 32 ft. in height, 102 ft. in length, and have a capacity of 250,000 c.ft. A saving of £4000 is anticipated as compared with the old type of holder, and that the scheme will lend itself to more economical working of the Department.

Gas Reserve Fund to Relieve Rates.—The Bingley Urban District Council, last week, approved an increase of 1s. 9d. in the pound in the rates, bringing the total to 16s. An amendment that the estimates be increased by £3000, in order to avoid taking that sum from the Gas Department reserve fund, was moved by Mr. T. Snowden, M.P. (Chairman of the Lighting Committee), but was defeated, only three members voting for it. Mr. Snowden objected that if the gas reserve fund could afford £3000 for the relief of rates, the gas consumers were being more or less deprived of a reduction in prices which they ought rightly to have enjoyed. He described the raid on the fund, in order to minimize the rates increase, as panic legislation.

Gas Fire Ventilation.

By W. J. G. DAVEY, B.Sc., Chief Chemist to the Birkenhead Corporation Gas Department.

At the June Meeting of the Institution of Gas Engineers in 1916, while seconding the adoption of the Third Report of the Ventilation Research Committee, Mr. J. H. Brearley, of Longwood, made the following remark: "We must hope we shall be able to go forward and at least make tests of practical installations in actual use." The war unfortunately intervened, and the excellent work of that Committee was directed into other channels demanding more immediate attention. These tests were never carried out, to the detriment of the gas industry.

The findings of that Committee are, however, of importance, and a summary of them will be of interest and use. While asserting that "the great differences in the conditions under which the problem of ventilation has to be faced in different cases enables us to understand that no series of simple prescriptions of universal applicability can be evolved" (1st Report, 1914, p. 1), they showed that ventilation depends upon three main factors:

(1) The area of the flue vent. "This, although not the only factor in determining the ventilating effect, is of primary importance." 2nd Report, 1915, p. 24.

(2) The rate of gas consumption. 2nd Report, pp. 12-17.

(3) The height of the flue or chimney. 3rd Report, pp. 13 *et seq.*

A fourth factor is the construction of the canopy (2nd Report, p. 24), which, to get the best ventilating power from a gas fire, must offer as little resistance as possible to the flow of the flue gases. A wide canopy with smoothness and simplicity of line (p. 26) would also be an advantage. This factor of the canopy is the only one of the four which is not amenable to simple measurement and calculation. Is it not negligible with modern gas fires? The fires tested by the Ventilation Research Committee in 1914-16 were such that, according to the 1st Report, p. 4, "Results . . . seemed to show that, after the fire had been burning for some time (so that standard conditions had been attained), there was, in most cases, a small, but determinable, escape of combustion products from under the canopy." I think one is justified in stating that with the modern gas fire there is no escape of products of combustion into the room. The wide canopy, simple and smooth in line and shape, and offering the minimum of resistance to the passage of the combustion products, is now the rule, and the canopy factor can be neglected in dealing with the subject of ventilation.

We are left with the three factors of the area of the flue vent, the rate of gas consumption, and the height of the chimney. For some months, under the able guidance of Mr. John Bond, O.B.E., I tested various types of gas fires at the Southport Gas-Works, and studied the above factors of ventilation. Although my work is far from complete, the main results may be of value, and stimulate further interest in the question of ventilation by gas fires.

Let us first consider the theoretical aspects of this question. According to Shaw, "the law of relation between 'head' and flow in ventilation circuits is $A = RV^2$."

Hartley gives the formula $(R_i + R_e)\ V^2 = A$, where A is the aeromotive force promoting ventilation, V the volume of air and products passing up the chimney, R_i the resistance of the inlets to the room being ventilated, and R_e the resistance of the outlets. With inlets to the room sufficiently large, however, R_i is negligible compared with R_e, and the formula becomes similar to that of Shaw, $A = RV^2$.

The aeromotive force promoting ventilation is, in the case of the gas fire, produced by the difference in temperature between the flue gases and the air of the room. The hot products of gaseous combustion heat the air in the chimney, and this air, becoming less dense, rises, drawing in air from the front of the fire. The volume of air passing up the chimney depends, therefore, upon the lesser density of the chimney gases, and consequently upon the difference in temperature between the chimney gases and the outer air. Shaw explains aeromotive force as the head of air which must be maintained to maintain the flow through the resistance. "The same head would be maintained by a column of water producing the same pressure as the air column; thus the aeromotive force may be expressed as the head due to a column of air or equivalent column of water." The actual relationship between the force of draught in inches of water and the aeromotive force in feet of air is given by the formula $W = 0{\cdot}015A$, where W = water pressure in inches and A = aeromotive force.

Clark's formula for calculating the force of draught in inches of water from the height of the chimney and the absolute temperature of the flue gases is as follows:

$W = h(0{\cdot}0146 - 7{\cdot}66/T)$, where W = water pressure in inches of water,
h = height of chimney in feet,
T = temperature of flue gases in ° Fahr. absolute.

It is thus evident that there is a direct relationship between aeromotive force and difference in temperature, so that these may be equated as follows:

$A = k(D)$, where A = aeromotive force,
D = difference in temperature between the chimney gases and the air of the room,
k = a constant.

The equation $RV^2 = A$ may then be written $RV^2 = k(D)$.

As the temperature difference is related to the total available heat by the equation

$D = KH/V$, where D and V are as above,
H = total available heat,
K = a constant,

we have $RV^2 = kKH/V$
or $RV^3 = kKH$
or $V^3 = kKH/R$

Therefore V varies as the cube root of H/R, and, assuming the total heat to be constant, we have V varies as the cube root of 1/R. Shaw gives the formula $R = k/a^2$, where a = the thin plate orifice area of the flue outlet, and k is a constant. Thus the thin plate orifice area of the flue outlet varies as the reciprocal of the square root of the resistance, and from the formula V varies as the cube root of 1/R, the volume of air and products passing up the chimney varies as the cube root of the square of the thin plate orifice area. V varies as $\sqrt[3]{a^2}$, so that any increase in ventilation can only be effected by increasing the thin plate orifice area to a relatively much larger extent, when the total available heat is constant.

If we have a flow of air through a straight tube with no bends, the thin plate orifice will be the same as the cross-sectional area of the interior of the tube—*i.e.*, the minimum flue area of the tube. With a gas fire, however, the stream of air must bend at right angles on entering the chimney. Clark's paper on "Eddies in Gaseous Fluids," January, 1913, is of interest in this connection. He states that a velocity of 178 ft. per minute through a vertical tube 6 ft. in length is reduced to 164 ft. per minute by eddies, on interposing an elbow of the same cross-sectional area as the top of the vertical tube. This eddy effect may best be regarded as a diminution of the thin plate orifice area of the tube, so that with a gas fire the minimum flue area is not the same as the thin plate orifice area, but we may assume that some relationship exists between them.

There is, then, a scientific basis to the experimental facts brought out by the Ventilation Research Committee, that ventilation depends upon (1) the area of the flue vent (which determines the resistance), and (2) the rate of gas consumption (which governs the temperature difference); and my first tests were to ascertain the relation between the volume of air passing up the chimney, the minimum flue area of the fire, and the rate of gas consumption.

It was realized from the start that the conditions of experiment were not ideal. Ideal results were not aimed at. Our aim was to test "practical installations in actual use;" and while it is gratifying to find that the results, where comparable, show good agreement with those obtained under conditions approaching the ideal in the Ventilation Research Committee's tests at Leeds University, it was thought that, even with the errors unavoidable in testing fires as we tested them, broader and more useful generalizations might be deduced than if the fires were tested in air-tight compartments and with all the refinements of expensive scientific apparatus.

RESULTS WITH THE 4-FT. CHIMNEY.

[For description of chimney and methods of testing see Appendix.]

Three series of tests were carried out, each with a different rate of gas consumption, and from the results two important relationships were found to exist between the minimum flue area, the volume of air and products passing up the chimney, and the difference in temperature between the chimney gases and the air of the room:

(1) V varies as 1/D where V = volume of air and products passing up the chimney in c.ft. per hour,
D = temperature difference in ° Fahr.

(2) V/MD varies as $1/\sqrt{M}$, where V and D are as above and M = minimum flue area in square inches.

From (1) and (2) we arrived at an important relationship be-

tween the volume of air and products passing up the chimney and the minimum flue area of the fire :

Thus V varies as 1/D and V/MD varies as $1/\sqrt{M}$.

Therefore V^2M varies as $1/\sqrt{M}$, $\frac{V}{V^2}$ varies as $M/\sqrt{M}$—*i.e.*, V^2 varies as $\sqrt{M}$, and V varies as $\sqrt[4]{M}$.

The factor $V/\sqrt[4]{M}$ was approximately constant for each series of tests, but varied as the gas rate, and when these constants are plotted against the gas rate, it is found that they conform to a straight line corresponding to the formula

$V/\sqrt[4]{M}$ = 0·0354 B *plus* 1340, where B = rate of gas consumption in B.Th.U. per hour, and V and M are as above.

TABLE A.

Gas Rate. B.Th.U. per Hour.	$V/\sqrt[4]{M}$.	0·0354 B *plus* 1340.
10,000	1680	1694
13,000	1830	1800
20,000	2055	2048

With the chimney of height 4 ft. above the base of the flue outlets to the fire, ventilation can thus be calculated from the formula

$$V = \sqrt[4]{M} \times (0{\cdot}0354\ B\ plus\ 1340)$$

where the symbols have the same significance as before.

The product of volume of air, &c., and temperature difference, as explained before, is constant for a particular gas rate, and consequently the heat losses to the chimney are constant for each particular gas rate ; but the percentage heat loss is found to decrease with increase in rate of gas consumption, the average percentage heat losses for gas rate of 10,000, 13,000, and 20,000 B.Th.U. per hour being respectively 49, 46, and 44. The percentage heat losses for gas rates above 20,000 B.Th.U. per hour appear to approach a constant figure. This seems to confirm the fact that the fires tested (ten radiants) are so constructed that their efficiency is greatest with a gas consumption of about 4 c.ft. per burner, or 2000 B.Th.U. per hour per burner with 500 B.Th.U. gas. It will be observed that the percentage heat losses are very high, but it must be remembered that the tests were conducted with a short chimney, with which, as will be demonstrated later, high percentage heat losses are to be expected.

EFFECT OF THE HEIGHT OF THE CHIMNEY.

In his paper on " Eddies in Gaseous Fluids," Clark worked out the ventilating capacities of chimneys of different lengths, and enunciates the law governing these :

V varies as $\sqrt[5]{L^2}$, where V = volume of air and products passing up the chimney, and L = length of chimney.

" The volume of air and combustion products passing up the chimney varies as the fifth root of the square of the length of the chimney."

This formula was tested by determining the volume of air and products passing up the chimney with chimneys of different lengths, one a 6-ft. chimney, and the other the house chimney of length 22 ft. above the base of the flue outlets of the fire. Our results conformed to the formula, and hence the formula for the 4-ft. chimney was extended to include chimneys of various lengths, thus :

$$V = \sqrt[4]{M} \times \frac{(0{\cdot}0354B\ plus\ 1340)}{\sqrt[5]{4^2}} \times \sqrt[5]{L^2}.$$

The fifth root of the square of four equals 1·741, and by dividing out the right hand side of the above equation by this figure we have

$$V = \sqrt[4]{M} \times \sqrt[5]{L^2} \times (0{\cdot}02B\ plus\ 770).$$

It should be noted that this formula is not absolutely correct, but purely empirical, and will not hold for rates of gas consumption below 5000 B.Th.U. per hour. Above this limit, however, there is a direct relationship between gas rate and ventilation, so that the formula holds good.

HEAT LOSSES AND CHIMNEY HEIGHT.

From fig. 13 in the 3rd Report of the Ventilation Research Committee, it can be shown that the temperature difference varies inversely as the cube root of the square of the length of the chimney, a relationship which was substantiated by the results obtained by us with the 4-ft. and 6-ft. chimneys.

The heat loss to the chimney, which is constant for each particular gas rate, is found to vary directly with the gas rate, so that with the 4-ft. chimney a straight line relationship between the heat loss and gas rate obtains, conforming to the formula :

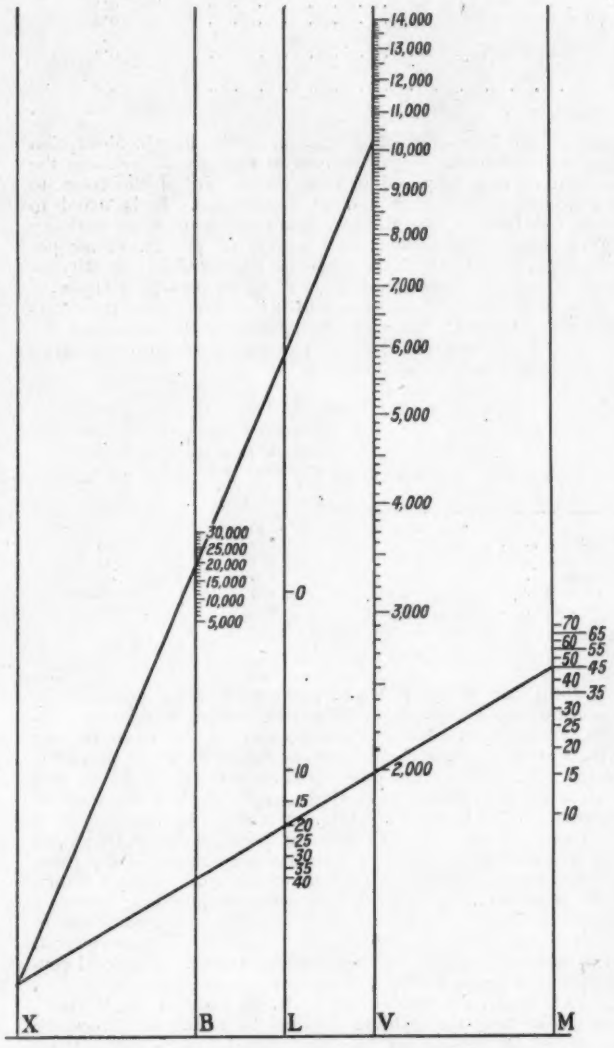
Heat loss = (0·390 × B) *plus* 1000, where B = gas rate in B.Th.U. per hour.

If V varies as $\sqrt[5]{L^2}$, and D varies as $1/\sqrt[5]{L^2}$, VD will vary as $1/\sqrt[15]{L^4}$; and utilizing this factor and the heat loss formula for the 4-ft. chimney, a general formula

$$\text{Heat loss} = \frac{0{\cdot}1606\ (0{\cdot}39B\ plus\ 1000)}{\sqrt[15]{L^4}}$$

is obtained, where L and B are as above, and 0·1606 is the fifteenth root of the fourth power of four.

The nomogram has been prepared so that the ventilation may be determined without calculation, given the minimum flue area of the fire, the rate of gas consumption, and the height of the chimney. To use this, draw a line through the required minimum flue area and height of chimney, in M and L respectively to meet line X, and from the point of intersection of



line X, draw a line through the required gas consumption in line B to meet line V. The point of intersection of line V gives the volume of air and products passing up the chimney in cubic feet per hour.

PRACTICAL APPLICATION.

It remains to demonstrate the possibility of applying the formula to give practical results, which is the ultimate ground on which experimental work of this type must stand or fall.

The heating effect of a gas fire for any particular room depends upon the area and construction of the walls, floor, ceiling, and windows of the room, its cubical capacity, and the difference in temperature which is required to be maintained between the outer air and the air of the room. A certain amount of heat will be absorbed by the walls, &c., per hour for each degree difference in temperature between the outside and interior of the room. A further quantity of heat will be used in heating up the air of the room from the outside to the inside temperature. The remainder of the heat will be lost in the promotion of ventilation.

The loss in B.Th.U. per square foot of surface for every degree Fahrenheit between the inside and outside temperature

has been determined for various materials, and is shown in Table B.

TABLE B.

—	Loss in B.Th.U. per Sq. Ft. per ° Fahr. Difference.
4½ in. brick wall	1·0
6 ,, ,, ,,	0·7
8 ,, ,, ,,	0·48
12 ,, ,, ,,	0·35
14 ,, ,, ,,	0·31
18 ,, ,, ,,	0·26
Single windows	1·0
Double windows	0·5
Ceiling with good air space	0·1
Lath and plaster ceiling	0·4
Lath and plaster partition	0·3
Floor	0·2

Given the area of the above surfaces, the loss in absorption can be determined. From the cubical capacity of the room the amount of heat required to heat up the air of the room to the desired temperature can be ascertained. It is usual to allow for three or four changes of air per hour in an ordinary living room, each person requiring 30 to 40 c.ft. of air per minute. 0·019 B.Th.U. is taken as the required quantity of heat to raise the temperature of 1 c.ft. of air through 1° Fahr.

Let us consider the room in which the above tests were carried out. Table C shows the dimensions of the room and the calculated absorption of B.Th.U. per degree rise in temperature by the walls, &c., of this room.

TABLE C.

—	Area in Sq. Ft.	Loss in B.Th.U. per Sq. Ft. per ° Fahr. Between Inside and Outside Temp.	A × B.
	A.	B.	
Floor	248	0·2	49·6
Ceiling	248	0·1	24·8
Windows	42	1·0	42·0
6 in. wall	311·5	0·7	218·05
12 in. wall	303	0·35	106·05
		Total	440·5

A total loss of 440 B.Th.U. per hour is thus sustained by absorption for every degree difference between inside and outside temperature. The cubical capacity of the room is 2600 c.ft., so that for four changes of the air of the room per hour, 10,400 c.ft. of air must pass up the chimney. This air will require 197·6 B.Th.U. for every degree Fahrenheit difference in temperature. The total B.Th.U. absorbed in the heating up of the room will thus be 440·5 *plus* 197·6—*i.e.*, 638·1 B.Th.U. per degree Fahrenheit. To maintain the temperature of the room at 65° Fahr., when the outside temperature is 35° Fahr., 638·1 × 30—*i.e.*, 19,143 B.Th.U.—will be required per hour. A certain amount of heat will also be lost in the promotion of ventilation. This may be calculated, but we will take 30 p.ct. as a reasonable figure for the conditions cited. The total consumption of gas in B.Th.U. per hour is thus 19,143 × 10/7—*i.e.*, 27,350 B.Th.U. per hour, or 54·7 c.ft. per hour of 500 B.Th.U. gas. Now we have a chimney of height 22 ft., and know the volume of air passing up the chimney and the gas rate. It remains to find a fire which will achieve this result. An eleven or twelve radiant fire will be necessary, the maximum rate of gas per burner being 5 c.ft. per hour. From the ventilation formula.

$$10{,}400 = \sqrt[5]{M^4} \times \sqrt[5]{22^2} \times (0{\cdot}02 \times 27{,}350 \textit{ plus } 770).$$

From this equation the minimum flue area becomes 27·6 sq. in. A fire will thus be necessary with a mininum flue area of about 30 in. Such a fire, provided that it is fitted with a well-rounded canopy, the bottom edge of which is some distance above the tops of the radiants, will ventilate the room adequately in normal circumstances.

The ventilation formula does not include such indeterminate factors as variation in direction or velocity of the wind, downdraught, &c., which assist or hinder ventilation, but it has been shown in numerous tests to apply under normal conditions.

CONCLUSION.

Sir Dugald Clerk and others have shown that, for heating and power, our great rival in the lighting department, electricity, cannot compete with us, and until the enormous but apparently un-get-at-able stores of intra-atomic energy can be tapped, gas will probably remain supreme in these departments. Nevertheless, economy necessitates a careful study of these, and the best use of gas for heating and power has yet to be found. In this scientific age, we should be able to determine the heating and ventilating effects of gas fires for any conditions, and we should strive to educate our salesmen and fitters in these matters, so that gas fires, the clean and efficient method of heating, may be supplied on scientific lines. The heating effects of gas fires have been exhaustively studied; the ventilating effects with which the former are closely connected have not received the attention that perhaps they should. If the publishing of these tests and results stimulates further interest in this important matter, the writer's work will be repaid.

I cannot conclude without expressing my thanks to Mr. John Bond, O.B.E., Engineer and Manager of the Southport Corporation Gas Undertaking, acting upon whose suggestion I carried out the work detailed above. It is with his kind permission that I have published the results. I have also to thank Mr. J. E. Lamb for his assistance in preparing the nomogram.

APPENDIX.

Test Room.—The room in which the tests were carried out was situated on the first floor of a ten-roomed house, and faced S.S.E. It was of the following dimensions: Area of floor, 248 sq. ft.; height of room, 10 ft. 6 in.; cubical capacity, 2600 c.ft.

Experimental Chimney and Apparatus Used in the Tests with the 4-ft. and 6-ft. Chimneys.—The gas fire was fitted to an experimental flue chamber of galvanized iron, encased in a wooden box of three-ply wood, leaving a 2-in. opening round the back and sides of the chamber, and round the front above the level of the top of the fire. The opening between the chamber and the wooden casing was filled with a mixture of asbestos fibre and glass wool. An opening of 209 sq. in. in the front of the chamber allowed free passage of air and products of combustion through the chamber and up the chimney. The latter was 144 sq. in. in area at its widest part, and tapered to an outlet area of 72 sq. in. A thin metal cross was fitted to the top of the chimney in such a way as to cause the least possible resistance to the passage of gaseous products up the chimney. Upon this cross was placed an anemometer, which had been compared with a standard instrument certified by Kew, and which was provided with a correction chart. A thermometer was suspended from the metal cross to determine the temperature of the flue gases. Near the floor, by the side of the chamber, was suspended a thermometer, encased in polished metal cylinders to prevent absorption of radiant heat, but allowing easy access of the air of the room to the thermometer. This position was considered the most favourable for the determination of the temperature of the air entering the chamber.

The gas was contained in a holder of 10,000 c.ft. capacity to ensure a constant quality of gas for the tests, and was admitted to the fire through a meter which was occasionally checked by an experimental meter, which in turn was tested with a 1/12th c.ft. standard measure. The gas at the outlet of the meter was passed through a mercurial governor, by which the pressure and rate of flow of the gas during a particular series of tests were kept constant.

Method of Experiment.—The fire to be tested was placed against the opening in the flue chamber, and the whole made gas-tight by caulking with asbestos paste (consisting of asbestos sheet kneaded to a pulp under water). After the gas fire had been burning at a predetermined rate of gas consumption for two hours (by which time it was observed that the temperature at the top of the chimney reached a constant maximum figure), the anemometer was placed on the metal cross at the chimney outlet, so that its pivot was directly over the centre of the chimney. (Experiments with the anemometer in various positions on the top of the chimney proved that this was the best position to determine the average velocity of the air and products.) The instrument was allowed 15 minutes to arrive at a constant velocity, and then the velocity of the air and products up the chimney for a period of two minutes (measured by a stop-watch) was determined. Three tests, during a period of half-an-hour, were made of the velocity. The results of these tests, which were found to vary within less than 1 p.ct., were averaged, the result corrected from the chart, and from the corrected velocity, the volume of air and products passing up the chimney in cubic feet per hour (corrected to normal temperature and pressure) calculated.

Tests with House Chimney.—The house chimney was found to be 23 ft. 6 in. in height from the floor level, the diameter of the circular chimney pot being 9¼ in. An opening into the tiled front of the chimney of 14 in. by 12¼ in. was made, with the bottom edge 10¾ in. above floor level. The chimney was found to widen from 6 in. at the bottom edge of the opening to 22 in. at a height of 3 ft. above the bottom edge, whence it tapered to 18 in. at a height of 9 ft. above floor level. From the latter point an inverted cone was suspended, so that its apex practically coincided with the widest part of the chimney. This cone, 8¼ in. in diameter by 10½ in. high, was intended to ensure intermixing of air and products of combustion, so that a representative sample could be obtained for analysis.

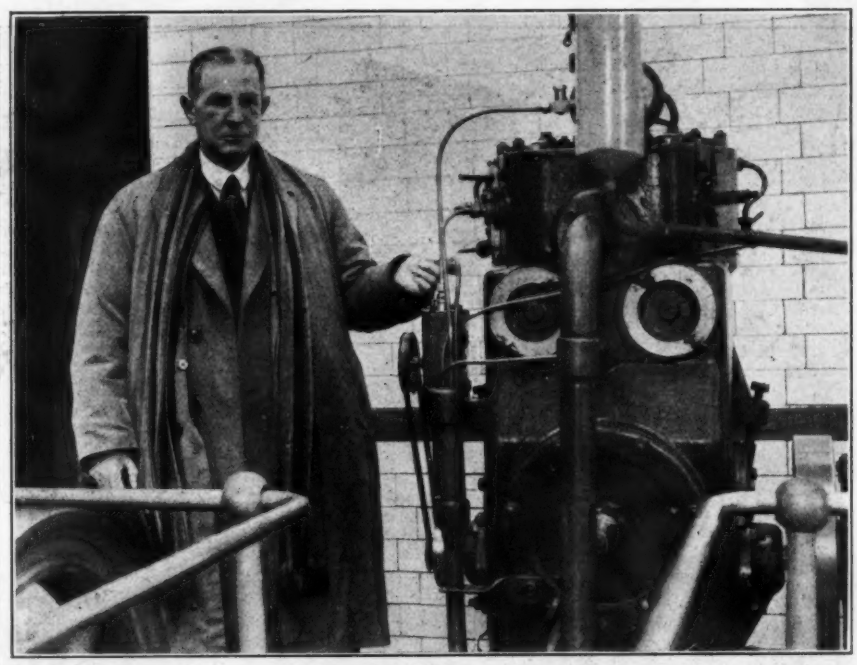
Sampling.—A spiral tube of ⅜ in. compo, open at the end, and perforated on the underside with 9 holes, ¼ in. in diameter and 1 in. apart, was introduced into the chimney at the point 9 ft. above floor level, and allowed to rest on an iron strip. Its free end was secured to the wall of the room, and to it was attached a length of rubber tubing.

Analysis of Flue Gases.—A known volume of barium hydrate solution of known strength was introduced into two series of Drechsel wash-bottles. The last bottles of the series were connected to calibrated aspirator bottles filled with water. The other end of one series was connected by means of the rubber tubing to the sampling device in the chimney. The end of the other series was open to the air. By opening the stop-cocks to the aspirator botttles, flue gases were bubbled through the first and air through the second series of wash-

bottles, the rate of flow being so adjusted that the fourth and last bottle in each series retained its original strength, thus ensuring that all the carbon dioxide had been absorbed in the first three bottles. When about five litres of flue gases and air had passed through the absorbing solutions, the experiment was stopped, the actual volume passing determined and corrected, and the contents of the bottles titrated against standard oxalic acid solution of such strength that 1 cubic centimetre was equivalent to 1 cubic centimetre of carbon dioxide. At the commencement of the experiment the barium hydrate solution was standardized by titration against the same oxalic acid solution, using phenol phthalein as indicator. A sample of the gas used in the test was exploded to determine the amount of carbon dioxide resulting from combustion of the gas. Having ascertained the percentage of carbon dioxide in the air of the room, in the flue gases, and in the products of combustion of the gas itself, it was a simple matter to calculate the volume of air and combustion products passing up the chimney. As a precaution against absorption of atmospheric carbon dioxide by the barium hydrate solution used for the experiment, the latter was contained in a bottle fitted with a bottom tubulure, which was connected to the measuring burette by a glass tube passing through a cork which fitted the top of the burette. A small hole in the cork enabled the burette to be filled or emptied at will. The above method was also used as a check test against the anemometer in the experiments with the 4-ft. and 6-ft. chimneys, and the results were found to show good agreement with the anemometer results.

Opening of New Plant at Bingley.

Drakes Vertical Retorts.



MR. TOM SNOWDEN, J.P., M.P. (LABOUR, ACCRINGTON), CHAIRMAN OF THE GAS COMMITTEE AND OF THE LIGHTING COMMITTEE OF THE BINGLEY COUNCIL, STARTING A SECTION OF THE PLANT IN THE POWER HOUSE.

The formal inauguration of a new installation of vertical retorts for the Bingley Urban District Council, supplied and erected by Messrs. Drakes, Ltd., of Halifax, took place on March 21, though the works actually began operating in mid-February.

There was a large gathering of chairmen, deputy-chairmen, and engineers of gas undertakings of West Yorkshire, by invitation of the Bingley Gas Committee and Messrs. Drakes. The installation, with the offices, has cost £34,000 and is guaranteed to give a nominal yield of 1,000,000 c.ft. per day of a calorific value of 500 B.Th.U., though it is confidently expected that this can be exceeded. Provision has been made for subsequent extension. The new plant comprises Bingley's first vertical retort equipment. The old horizontal retort plant, which the new works adjoin, is to be demolished, and the site utilized for a new gasholder. The gas manufactured by the Department in the year ended March 31, 1929, was 173 million c.ft.

THE NEW PLANT.

The site on which the Drakes vertical retort installation has been erected is adjoining the existing works, and is situated on the banks of the River Aire. The natural ground originally sloped towards the river but this had been filled in to an approximate depth of 14 ft., and is supported by a stone retaining wall.

Foundations.—Pile foundations being a necessity, the "Vibro" pile system was chosen on account of its particular construction and its suitability for the purpose, an important factor being the rapidity with which the piling could be completed. The reinforced "Vibro" piles are braced together with reinforced concrete beams and support a reinforced concrete floor.

Retort House and Coal Store.—The retort house is of steel construction, the walls and panels being built entirely with engineering bricks. The window openings are fitted with steel casements and glazed. The steel roof is covered with best Welsh slates, and along one side patent glazing is provided to permit of ample lighting of the charging stage. The coal store formed alongside the retort house is also of steel construction, with walls and panels built with engineering bricks. This coal store is surmounted with a cast-iron tank divided into three compartments for the storage of tar, liquor, and water.

Vertical Retort Stack.—The vertical retort stack consists of 16 retorts, built in four settings of four and arranged in units of two. Each retort has a guaranteed nominal coal throughput of four tons per diem, and, in addition, is capable of being steamed according to the quality of gas desired up to the extent of 25 p.ct. of its throughput. The four beds are guaranteed to give a nominal yield of one million c.ft. of gas per day having a calorific value of 500 B.Th.U. per c.ft., but it is confidently anticipated that this will be exceeded.

Provision has been made in the house for accommodating an extension consisting of two further settings of four retorts, the total lay-out being designed to meet conveniently the varying requirements of a works up to a nominal capacity of 1½ million c.ft. per day, to allow of the utmost flexibility in working, and to permit of repairs and renewals being carried out without inconvenience.

The chimney, which is of steel construction, is designed with ample capacity to work the whole 6 beds when the future ex-

tensions provided for are carried out. This chimney has a firebrick lining, and there is a layer of insulating material between the firebrick lining and the steel casing. An arrangement of dampers permits the retort settings to be worked either direct from the chimney or through the waste-heat boiler.

Producers.—Each setting of four retorts is heated by an individual producer arranged in front of the setting. A coke hopper of 48 hours' capacity, provided with a swivelling feed shoot, supplies fuel to each producer. These hoppers are filled by means of shoots from the gravity bucket conveyor. The producers are fitted with Drakes patent hanging bar type grate.

The design of the bars, which are pressed from steel plate, is such that combustion of fuel does not take place within the bar, and a clear water-way is provided which ensure that the bars always remain cool. The arrangement of the furnace minimizes formation of clinker, prevents wastage of fuel in cleaning, and generally reduces the fuel consumption per 100 lbs. of coal carbonized to the lowest possible minimum.

Retort Settings.—The retorts are of Meltham silica, oval in section, and are constructed with specially moulded segmental blocks of uniform taper. The whole of the internal setting, walls, and floors are constructed of the same material, thus ensuring a unit which will withstand high temperatures and

GENERAL VIEW OF RETORT HOUSE FROM COAL PLANT END.

permit of uniform expansion and contraction, which latter is a very important factor so far as the life and behaviour of settings is concerned. The draughting of the settings is downwards, against the natural tendency of the gases, whose velocity can be controlled without the necessity for restricting areas; hence a generous, mellow combustion is obtained which is "kind" to the refractories. The supply of producer gas and secondary air to the settings is arranged in such manner that the heat can be applied throughout the entire length of the retort as may be desired. The fact that the heats may be concentrated, equalized, or alternated at will, permits of temperatures being adjusted in any zone throughout the length of the retort to suit the requirements of varying classes of coal. Any calorific value of gas may be manufactured from 400 to 550 B.Th.U. per c.ft., without in any way reducing the guaranteed nominal throughput per retort. The steaming zone may be extended or reduced according to requirements, and the temperatures can be adjusted to maintain a perfect water gas reaction at any rate of throughput without affecting conditions appertaining to any other portion of the retort. In the front walls of the settings sight boxes provide a convenient and adequate inspection of the combustion chambers from the top to the bottom of the retort. The control dampers, of which there are a minimum number, are arranged in easily accessible positions. The settings are immediately responsive to the slightest variation of the control dampers, which latter are simple in manipulation.

The producers and the settings are completely insulated—*i.e.*, tops, bottoms, fronts, and sides—by a course of highly efficient insulating bricks incorporated in their construction. It is of interest that the settings are insulated one from the other. The amount of heat lost to radiation is conserved to a remarkable extent.

The firebrick material used in this installation is all of John Morton & Company's well-known "G" quality, manufactured, without admixture, from a natural, mined clay, having an ideally proportioned silica and alumina content.

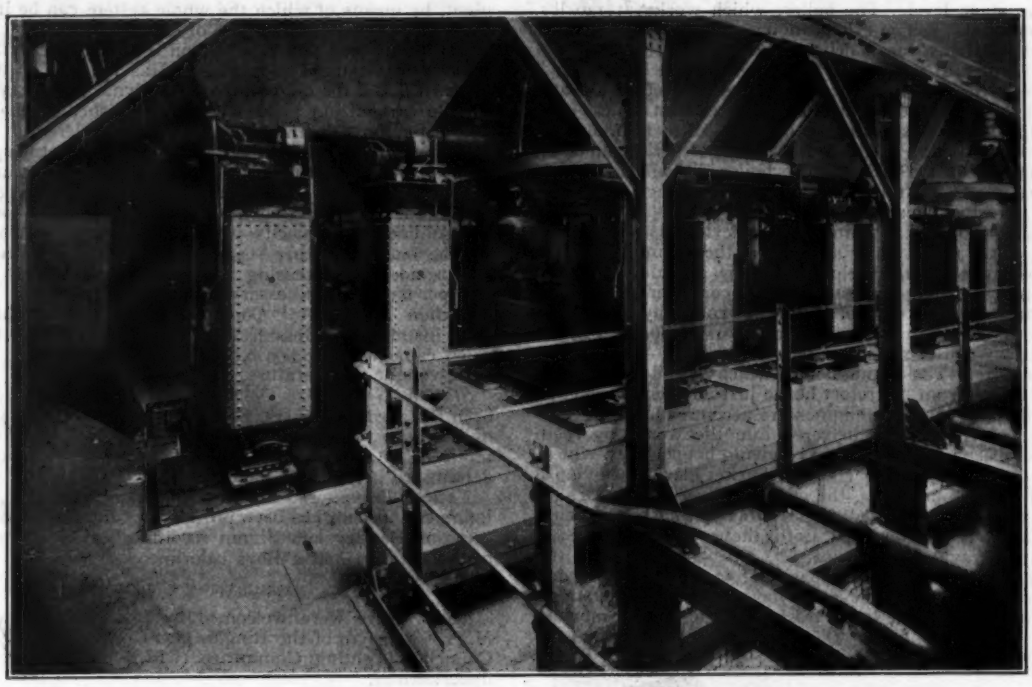
Supporting Structure and Platforms.—The whole of the supporting structure and the bench bracing is of an exceedingly substantial nature. Well arranged staircases and platforms provide easy access for inspection of every part of the plant, from the topmost platform over the coal hoppers right down to the ground floor. The charging platform is spacious and cool, and is well lighted by a continuous line of patent glazing arranged in the roof. No auxiliary fans or ventilating systems of any description are necessary to ensure satisfactory working conditions for the operatives on this platform.

Retort Mountings.—The mouthpieces, gas off-take pipes, and hydraulic mains are neatly nested, but afford every facility for convenience, as each group is surrounded by a spacious gangway, and all valves, inspection plugs, and covers are easily accessible.

The gas, tar, and liquor circulating pipes are all of ample capacity to permit of free and easy traverse of their respective contents. The coal valves supplying the retort feed hoppers are of the inverted cone type, and their faces may be ground to a perfectly gas-tight joint by means of a few strokes of the valve operating lever. Valves are provided for isolating each retort during scurfing operations. A remarkable immunity from tar troubles is attributable partly to the manner in which the heats are applied and partly to the very efficient system of liquor circulation and tar separation which is incorporated. The gas off-take pipes are so cool as to permit the hand being placed on them without discomfort. Expansion or contraction when getting up or letting down beds is provided for by means of an expansion socket situated between the mouthpiece and the collecting main, and which prevents disturbance to either the brickwork or the ironwork.

A travelling coke chamber, supplied from a large overhead coke storage hopper and running on a mono-rail, is provided for filling the retorts after scurfing.

A Braddocks retort house governor to maintain equable con-



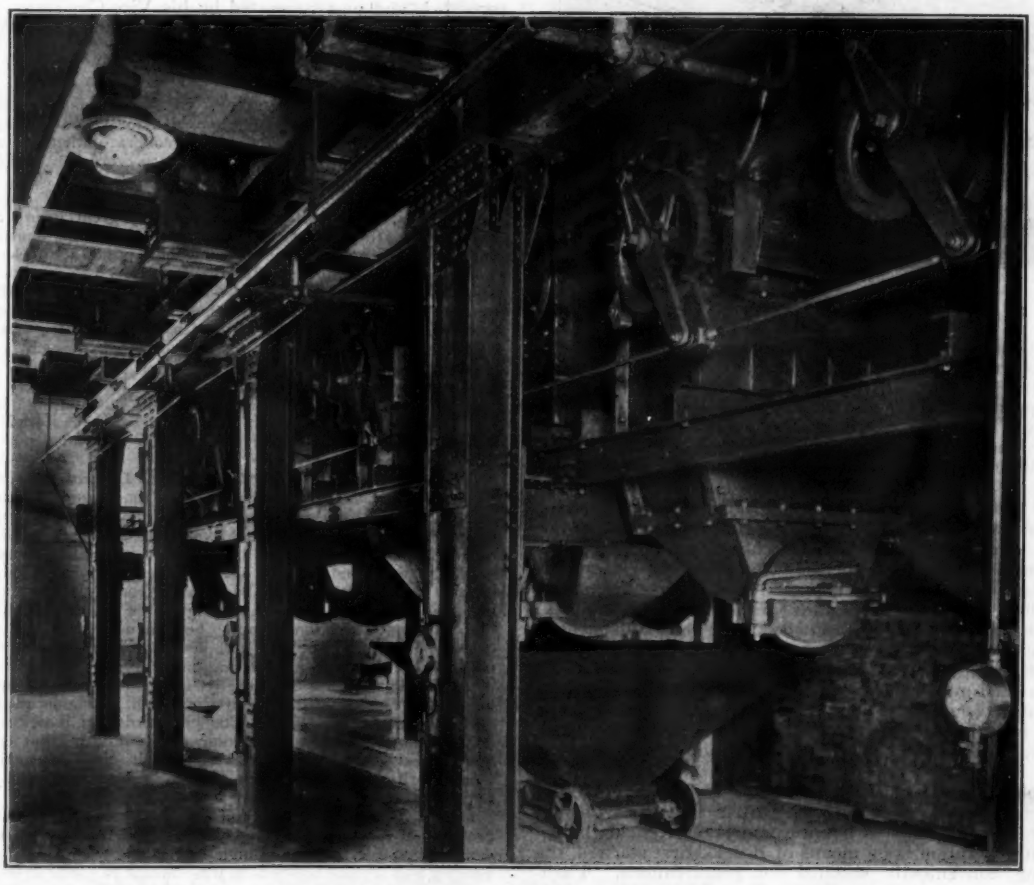
TOP MOUNTINGS. CHARGING FLOOR LEVEL.

ditions on the retorts is incorporated, and easy access to this is obtained from an inspection platform. Indicating gauges of the "dead-beat" type are provided at the governors and also on the charging stage.

Discharging Floor.—The throughput of the retort is regulated by the speed of extraction of the coke which the extractor itself deposits into a large coke receiving chamber provided with a self-sealing door. The extractors are fitted with variable speed mechanism, which enables throughput to be regulated to a nicety. They are driven by steam engines, built for continuous running and arranged in duplicate, and the power is transmitted through gearing and rods always in tension. In each extractor casing there is a manhole fitted with a self-sealing door, and arranged in such manner that full-way access to the retort is obtainable without disturbing any part of the mechanical equipment.

Steaming facilities are provided in the extractor casings, the amount of steam required being controlled and indicated by Coe's patented appliances. All steam pipes and connections are lagged to avoid condensation and to ensure the steam delivered being as dry as possible.

Waste-Heat Boiler.—The steam required for the plant and for general works purposes is produced in a Spencer-Bonecourt waste-heat boiler, fixed in a convenient and accessible position



BOTTOM MOUNTINGS.

at charging stage level. The boiler, which works at 120 lbs. pressure per sq. in., has an evaporation of 4000 lbs. of steam per hour, and the exhaust fan is driven by a steam turbine.

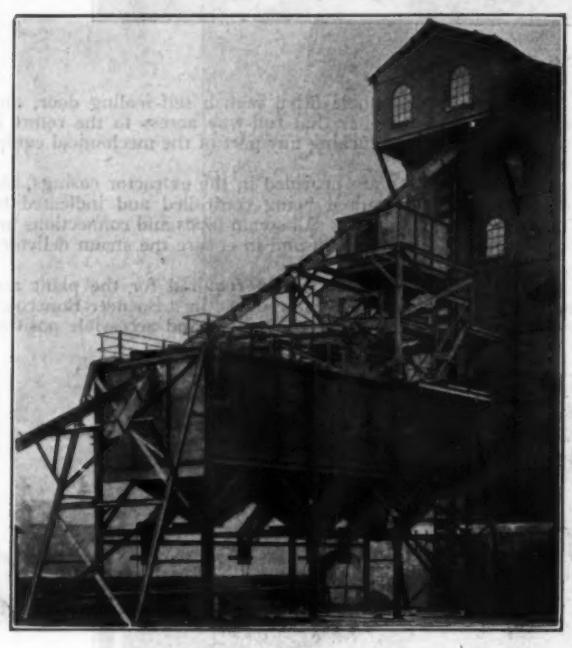
The feed water to the boiler, which is supplied by "Weir" type pumps arranged in duplicate, is passed through a water heater and is pre-heated by means of the exhaust steam from the turbine. A steam superheater is arranged in the gas inlet chamber to the boiler, and this is capable of giving an additional superheat of 100° Fahr. The boiler and all steam connections are lagged with an efficient boiler covering.

Lift.—A direct-coupled steam-driven lift, controlled from the cage and equipped with automatic safety devices, is arranged at one corner of the retort house adjacent to the engine house and is connected to all the principal floors by spacious landings. The lift and platforms surmounting the coal storage hoppers are so arranged that in case of emergency coal may be handled by means of hopper bottom bogies, trap doors being arranged in the coal hopper platform for receiving the coal.

Engine House.—The engine house, which has tiled walls and floor, is built out from the retort house just adjacent to the lift. Here, the lift and extractor engines are accommodated.

Coal Plant.—All coal is delivered into the works by road. The vehicles discharge into a large receiving hopper from which, by means of a short, totally enclosed bucket elevator having a capacity of 30 tons per hour, the coal is delivered to a Drakes 2-roll breaker or is by-passed direct either to the retort house or the coal store conveyors. Both these conveyors are of Drakes lipped gravity bucket type.

The coal store, which has a capacity of 500 tons, is filled and emptied by a gravity bucket conveyor which runs the entire length of the house. The lower track is arranged in a subway,



Coke Plant at Bingley.

and convenient openings are left in the floor of the coal store so that the coal may be withdrawn and transferred by means of shoots to the gravity bucket conveyors supplying the overhead storage hoppers, the latter having a capacity equal to 48 hours' requirements. It will, therefore, be appreciated that coal, broken or unbroken, can be mechanically handled either direct to the overhead storage hoppers or to the coal store, or from the coal store to the carbonizing plant in any manner desired. The lipped gravity bucket conveyor for supplying the overhead coal hoppers for the carbonizing plant encircles the whole of the house and is arranged to handle both coal and coke.

Coke Plant.—The coke from the retorts may be either conveyed to the overhead storage hoppers for supplying the retorts after scurfing operations or to the producer supply hoppers. After these requirements are satisfied, the coke is conveyed forward, where it may be either stacked in the yard, or, alternatively, delivered to a Drakes screening and grading plant, which is erected over steel storage hoppers of 90 tons capacity. Here the coke is screened and graded into four sizes. Road vehicles may be loaded direct from the hoppers, and shoots also deliver coke to a platform where the various sizes may be bagged.

The whole of the coal and coke handling and grading plant is driven electrically by totally enclosed British Thomson-Houston motors through machine-cut gearing and Hans Renold chains. The starting operation is by means of Brook-Hirst starters, the latter being conveniently situated for requirements. Push-button controls are fitted in numerous positions all over the plant, by means of which the whole system can be immediately brought to a standstill in case of emergency.

The plant was put to work on Tuesday, Feb. 18, the first retort being charged at mid-day. Gas was put on to the town forthwith, and the old plant closed down. At a very early date the old carbonizing plant will be demolished as the site is required for the accommodation of a new holder.

Condensers.—The condensers were of the atmospheric type and consisted of a series of pipes 7 in. in diameter and were too small to deal with the maximum production of gas. These have now been superseded by a Clapham water-cooled set of one million c.ft. capacity per day, arranged in two units and can be operated either separately or together. Provision has been made for increasing the capacity of these to 1½ million c.ft. per day when necessary.

Station Meter.—A "Connersville" dry meter has recently been installed by Messrs. W. C. Holmes & Co., Ltd., with a rated capacity of 60,000 c.ft. per hour and is fitted with pressure, volume, temperature, and time recorders.

Station Governors.—New station governors have recently been installed by Messrs. Bruce Peebles, of Edinburgh, and are of the twin type, arranged with rolling weight, entirely automatic in action, and are designed to maintain a uniform predetermined pressure in the district.

Testing Room.—To meet the requirements of the Gas Regulation Act a room has been provided for the Gas Examiner, and contains Beasley and Sigma recording calorimeters, a Sigma heat indicator, and a Boys calorimeter.

INAUGURATION CEREMONY.

The visitors were welcomed by Mr. Tom Snowden, J.P., M.P., Chairman of the Bingley Gas Committee and also of the Council's Lighting Committee (which includes the electricity undertaking).

Mr. SNOWDEN said he felt that, after visiting the new works, those present would be convinced not only that Bingley was a progressive town but that it had confidence in the future of the gas industry, despite the many claims of electricity. He paid warm tribute to the work of Messrs. Drakes, Ltd., the contractors; of Mr. J. B. Balmforth, the Council's Gas Engineer; Mr. H. Bottomley, the Surveyor; and Mr. E. O. Robinson, the Council's Architect, who designed the offices. "These new works symbolize the real progressive character of the town," said Mr. Snowden, in unveiling a wall tablet in the offices, placing on record the date of the occasion and the names of the members of the Gas Committee.

The mechanical plant was subsequently started up by Mr. WALKER LONGBOTTOM, Vice-Chairman of the Committee.

Those present were entertained at luncheon, as the guests of Messrs. Drakes, Ltd., at the Princess Hall. Mr. SNOWDEN presided, and was supported by his Vice-Chairman, by Mr. J. Wilfrid Drake, and by leading gas engineers of West Yorkshire.

Luncheon Speeches.

Councillor ROBERT CALVERLEY, J.P., Chairman of the Keighley Corporation Gas Committee, proposed a toast to the Bingley Urban District Council, and offered hearty congratulations to the Bingley Council on erecting an entirely new gas-works in the face of the plentiful—if foolish—talk that the day of gas was over. They who were interested in the gas industry knew that, far from being on its last legs, the industry still had a very great future ahead of it in all its departments. Councillor Calverley said the question of rates increases was very much in the public mind at present in West Yorkshire, and he noticed that Bingley Council—not with the willing consent of the Gas Committee—had taken a substantial sum from the gas undertaking reserve to help in minimizing a new increase in rates. Frankly, the first duty of a gas committee was to its own consumers, and one could not be surprised if such a committee objected to having its reserves taken for purposes other than those connected with the undertaking. If an authority had any money to give away as the result of successful gas-making, it was only right that it should be given to the gas consumers who had contributed to that success, after making due allowance for future contingencies or possibilities of extension.

Councillor WATSON WHITWHAM, J.P., Chairman of the Bingley Urban District Council, replying to the toast, said he was interested in the remarks of their friend from Keighley, and particularly his reference to rates, but he would like to mention that, while Keighley's rates had just been increased by 2s. 3d. in the pound, those of Bingley had been increased by only 1s. 9d., the difference of 6d. being due entirely to the help which had been given by their successful gas undertaking. That was something to be gained by the whole of the community and something to be remembered to the credit of the gas undertaking. He was not, however, at all surprised by Councillor Calverley's view of the matter of taking gas reserves for relief of rates. It was, not unnaturally, quite the correct attitude of those primarily responsible for the welfare of a gas undertaking, and he, as Chairman of the District Council, would not have been surprised to find himself a very unpopular personality in that gathering of gas enthusiasts because he was Chairman of a body which had had the temerity to take a nice sum of £3000 from the gas undertaking whose new works they had just visited.

Mr. W. B. MCLUSKY, Halifax Gas Engineer and General Manager, proposed a toast to the Bingley Gas Department. He said he was delighted to see how the Bingley gas undertaking was progressing. Bingley had a plant now which was enough to tempt even a Scotsman to spend his money. He wanted particularly to congratulate Bingley

on their very live gas sales organization. To his mind, this side of the industry was of extreme importance to-day. Gas gave a service which in itself was a splendid defence, but no goals were scored by defence only, however excellent, and it was to the development of the sales organization that gas must look, in the face of modern competition, for the means of keeping pace with its rivals and with the needs of the times.

An Excellent Plant.

Councillor Tom Snowden, replying, said it was common knowledge in Bingley that there were great differences of opinion in the Council as to whether or not they should have those new works, but he believed what really settled the matter at last was that they learned of two places, one a thrifty little Yorkshire town (Silsden) and the other Aberdeen, where they were so confident of the future of gas that they were spending big sums of money on extending their works, and they felt that if thrifty Silsden and even more thrifty Aberdeen could risk it, Bingley could safely take a chance in spending less than half as much. [Laughter and applause.] They made exhaustive inquiries as to the best contractors, and they were now quite satisfied that every penny of expenditure incurred on the Drakes plant was justified. ["Hear, hear."] They believed they had got the last word in gas plant at the moment, though they recognized that there was no finality in gas constructional engineering, and that there was such a future still ahead of gas that they could not know how far they would ultimately have to go. He did suggest, however—and he said it as a Member of Parliament without hesitation—that if gas was going to have a fair chance of giving its best service in competition with electricity, it was high time some ancient and handicapping legislation was scrapped, and some fairer legislation took its place. If they could get that, coupled with the great research work that was going on in the industry, and good salesmanship and enterprise, he had no doubt at all that gas would give an extremely good account of itself in face of any competitor.

Councillor Walker Longbottom, Vice-Chairman of the Bingley Gas Committee, proposing a toast to the contractors, said that operations began on Feb. 4, 1929, were handicapped greatly at the very beginning by the great frost of that period, but made such good progress that the plant was completed and could have been ready for gas-making, if required, before the end of the year. Feb. 18, however, was fixed as the date for starting the new plant; the gas was put on the district the same night, and the old plant was closed down the following day. The plant was working in most satisfactory manner, and the workmen, hitherto accustomed to a horizontal retort equipment, had adjusted themselves splendidly to the new conditions, thoroughly satisfied with the convenience and cleanliness which were provided by the Drakes vertical system.

Mr. J. Wilfrid Drake, Chairman and Managing Director of Messrs. Drakes, Ltd., in responding to the toast, said it was difficult for one who had merely done a conscientious job to reply to so many eulogistic observations. He really felt that the Drakes organization had now reached a state in which they could hardly do a bad job if they tried. It was delightful to know that the efforts of the firm and their workmen were appreciated—and nobody knew better than a contractor how many ups and downs and unexpected problems and hindrances and difficulties could arise during the process of such a large contract.

Mr. Drake asked leave to make a presentation of a handsome silver three-arm candelabra to Mr. Snowden, as Chairman of the Bingley Gas Committee, and a silver cigarette case to Mr. Longbottom, as Deputy-Chairman, as a small mark of appreciation of the support and co-operation which the contractors had enjoyed at their hands during the work.

Councillors Snowden and Longbottom responded, and expressed their appreciation not only of the gifts but of the happy relationships of the contractors with the Committee and with the Bingley Gas Engineer.

A toast to the Gas Engineer (Mr. J. B. Balmforth) was proposed by Mr. H. M. Dawson, West Riding County Councillor for the Bingley area, who said he had particular pleasure in proposing this toast because, as the lawyer who had been briefed by the opposition to the scheme, he was sure the whole of the ratepayers of Bingley must recognize that—whatever they felt as to the actual necessities of the new works—they certainly had got a magnificent public asset.

Mr. J. B. Balmforth, replying to the toast, said the plant had now been running for more than a month, and had given no trouble in the way of "hang ups," which was rather expected of a new plant, or with tar or anything else. He had the tar mains opened a week ago, and found them as clear as when they started. Messrs. Drakes had carried out the work well and expeditiously and in entire harmony with the Committee and himself. Mr. Balmforth said he wished to pay due tribute to the large amount of credit which was due, in this matter, to the Chairman and Vice-Chairman of the Committee, to the Town's Surveyor and Architect, to his own colleagues on the staff, and to the willingness of the workmen to adapt themselves to the changed conditions.

A toast to "The Guests" was proposed briefly by Councillor Jabez Whittingham, Vice-Chairman of the Bingley Urban District Council; and responded to by Alderman J. Barlow, J.P., Chairman of the Accrington and District Gas and Water Board.

Glimpses into the Past.

From the "JOURNAL" Eighty Years Ago.

A Strange Meeting.

[The following is from a report of a meeting of the St. Marylebone Gas Consumers' Company.]

Mr. John Marriner, the Secretary, said it simply resolved itself into a commercial question. If you think proper to trust a man, and he does not pay you, it is not right that another person should be mulcted for the debts of his predecessor. [Loud cries of "That is not answering the question."] With proper men about them, and proper supervision, care would be taken that they were only supplying such parties as would pay. The Secretary has the proper supervision of your business, and ought only to supply those who you are sure will pay. [Cries of "Oh, oh!" and confusion.]

At this stage of the proceedings the indignant and violent tone of the meeting was changed into one of the greatest merriment, consequent on a Mr. Phelps jumping on the table and declaring that he moved a vote of thanks to "Mister John Marriner, Esq." After the laughter had somewhat subsided,

Mr. Shield said that most men were satisfied with one handle to their name, but the gentleman who moved this had given Mr. Marriner two. [Renewed laughter and uproar.]

Mr. Edward Smith: If that gentleman is not as well educated as Mr. Pearse, or the other great gasometer beside him, he is more to be pitied than laughed at.

Mr. Shield: Well, I move, then, that the gentleman be pitied. [Roars of laughter, groans, and cries of "Turn him out."]

Mr. Pearse: And I move that "Mister Edward Smith, Esq., publican, of the Tyrawley Arms, High Street, be also pitied." [Renewed uproar, and cries of "Turn him out!" on which a rush was made at Mr. Pearse, who exclaimed, "Here is a ruffian placing his hands on me!" and he retreated towards the Chairman, on whom he called for protection.]

Mr. Concanen (amidst cries of "Why don't you go and get shaved?" in allusion to a tremendous moustache and beard which he wore) seconded the motion.

And Another.

[At a later meeting, when Mr. Pearse was making a rousing speech, and offering challenges to all and sundry, the following interludes, among many others, are recorded in the columns of the "Journal."]

Mr. Pearse: What are you?
Mr. Staines: I am a brewer.
Mr. Pearse: Then I will give you a friendly call.
After prolonged interruption and confusion,

The Chairman put it to the meeting whether they would hear Mr. Pearse out or not. [Loud cries of "No, no!" and "Yes, yes!"]

Mr. Pearse: You shall hear me! [Tremendous cheering and uproar.]

The Auctioneer's Hammer.

Another row took place on the platform, and the Chairman, who held in his hand a large auctioneer's hammer, was seen to make a blow at Mr. Frampton, who appeared to feel discretion the better part of valour by making a precipitous retreat towards the back. Shortly afterwards Mr. Wilkins reappeared on the platform, having disengaged himself from a row in another part of the room, and his crushed hat bore ludicrous testimony to the severity of the bonneting which he had received. His appearance excited the most boisterous merriment.

Mr. Pearse: Here is one of the gentlemanly esquires calling the Chairman a "humbug." [Roars of laughter, cries of "Turn him out!" and continued uproar.]

The Chairman: Yes, the Emperor of China (in allusion to Mr. Frampton's trade as a chinaman) has called your Chairman a humbug. I think we have had enough of gas, and I shall put the resolution.

Mr. Shield: I have another amendment to propose (jumping on a table).

Not Exactly Decisive.

The Chairman paid no attention to Mr. Shield, but put the resolution, which he declared to be carried, although from the confusion which prevailed no one appeared to know what was the question, and it was impossible to say, therefore, how the matter was disposed of in reality.

Oxide Purification.

Economies Resulting from Selection of Oxide and Organization of Operations.

By S. K. Hawthorn, of the Birmingham Gas Department.

[From a Paper before the Midland Junior Gas Association, March 13.]

The cost of purification of coal gas by oxide of iron does not often exceed one halfpenny per 1000 c.ft. A market for sulphuric acid favourably influencing the price of spent oxide has been known to cause a balance on the credit side. The opportunity for spectacular economy does not exist; nevertheless, it will be shown that improved methods of working, and careful selection of oxide, combined with concentration on details and systematic organization, put into operation on a large works, have effected savings amounting to thousands of pounds per annum, although, when expressed as a decimal part of a penny per 1000 c.ft., the result may not appear so striking. This economy has been accomplished, moreover, without structural or other essential alterations to the existing plant. It will be shown that the primary factor in the improved methods of working is the adoption of a particular prepared oxide.

When choosing an oxide, three factors have to be considered: (1) Activity; (2) physical characteristics; and (3) price.

Good activity is essential, but an oxide cannot be chosen solely on chemical affinity for H_2S. Physical characteristics are equally important, as they influence the design and whole method of working of the purification plant. The prices of oxide now on the market do not vary greatly, the maximum difference in price of various products seldom exceeding 8s. or 9s. per ton. In these circumstances initial price is only a secondary consideration—a saving in first cost may be easily offset by excessive moisture content or greater cost of working due to back pressure.

Natural Oxides.

Bog ores (Belgian, Dutch, and Irish) consist essentially of peat fibre impregnated with ferrous and ferric hydrates. Their activity is moderately good, but several foulings and revivifications are usually necessary to attain a saleable sulphur content of 45 to 50 p.ct. Physically, they have the disadvantages of a high moisture content (usually about 60 p.ct.) and a non-uniformity of texture. At least two-thirds of the moisture content is not only useless, but a definite hindrance, as it nullifies activity, reduces gas temperature by evaporation, and, through lack of porosity and self-support, causes the oxide to work heavily, with consequent high back-pressure. Owing to the "clayey" nature of bog ores, the free moisture content is exceedingly difficult to expel. Due allowance for the high moisture content must be made when comparing prices with other oxides. A further disadvantage due to high moisture content is that the drying-off of the ore in a box is accompanied by a marked shrinkage which causes a V-shaped trench to be formed all round the sides of the box, with consequent by-passing of the gas. On several occasions, when this oxide was in use, it was necessary to raise the box cover and ram new oxide into the space about the sides of the box. The non-uniformity of texture of bog ores consists in the existence of an appreciable proportion of various sized nodules which in themselves are heterogeneous and which do not offer sufficient surface area to the gas. The surfaces of the nodules quickly acquire a coating of sulphide which prevents further action.

Quarried oxides have apparently depreciated during the last few years, possibly owing to the better quality deposits being nearly worked out. Their activity is poor, particularly after 35 p.ct. of sulphur has been absorbed, and several foulings are necessary to attain a saleable sulphur content. The density of these oxides is high (about 75 lbs. per c.ft.), and, even when the economical limit of sawdust is added to open the texture, excessive back-pressure is not uncommon. The absorption of H_2S in the boxes is accompanied by an expansion of the oxide which commonly causes cracked plates. The part-spent and spent oxide is hard and difficult to remove from the boxes. Manual crushing is a very arduous task. The use of these oxides is restricted to those plants with ample capacity where the gas temperature is not below 70° Fahr. Under less favourable conditions they are unsuitable.

Artificial and Prepared Oxides.

It is inadvisable here to discuss the relative merits of various artificial oxides commonly advertised under well-known trade names. Suffice it to say that the oxide now used at Nechells is a material prepared by treating spent oxide with solvents for sulphur removal and then for cyanide recovery. In order to avoid cumbersome references this oxide will be designated oxide "A." This product has an open texture, is light in weight (about 40 lbs. per c.ft.), and is physically homogeneous. It consists essentially of small non-adhesive particles of organic matter coated with a paste of hydrated oxide of iron, thus exposing a maximum active surface to the gas. The moisture content is 35 p.ct., but this is insufficient to make the oxide bind when pressed in the hand.

The activity of oxide "A" may be gauged from the fact that 30 p.ct. of the new oxide used is spent after the first time in a box, while it is always spent after the second exposure; there is no tendency to fire through too vigorous revivification, nor, as far as our experience goes, is there any corrosive action on the cast-iron plates of the purifiers—these are two common failings of artificial oxides.

The large annual saving compared with the previous method of purification is primarily due to the use of this oxide. Its activity is greater than that of any oxide previously used, and its physical characteristics have been responsible for many of the economies which will be discussed later.

Description of Plant.

The annual make of coal gas at Nechells is approximately 4800 million c.ft., giving an average make of 13 millions a day. The maximum daily make is 22 millions. The calorific value of the gas is 475 B.Th.U.

The dry purification plant consists of 24 cast-iron primary boxes 40 ft. by 35 ft. by 6 ft. deep, of the water lute type, and 6 cast-iron luteless catch boxes 44 ft. by 36 ft. by 6 ft. deep.

The gas divides into six streams at the inlet to the purifiers, and each stream passes through four primary boxes and one catch. Each set of four primary boxes is served by a centre valve. The arrangement of connections only allows an upward flow of gas. The catch boxes may be worked with either an upward or a downward flow of gas, a downward flow being usual. One of the advantages of downward flow in catch boxes is the facility for changing the top, and most sulphided, layer in an emergency without emptying the whole box.

Two well-known rules for computing the sizes of purifiers are as follows:

(1) "Set of four purifiers: Allow as a minimum an area of 0·5 sq. ft. for each box per 1000 c.ft. of gas to be purified per maximum day." (Meade.)

(2) "Allow 30 c.ft. of oxide per million c.ft. of gas purified per annum." (Davidson.)

On the basis of Rule 1, the area of each primary box at Nechells is 0·38 sq. ft. per 1000 c.ft. of gas per maximum day; or, computed from Rule 2, the allowance is 20·23 c.ft. of oxide per million c.ft. per annum, according to the type of oxide used. It will be shown later that the type of oxide used affects the depth of the layers and consequently the volume of oxide.

An oxide crushing and blowing plant was supplied by Messrs. Henry Simon, Ltd., of Manchester, in 1924. The duty of the plant is first to crush the part-spent oxide, and then to deliver it to any required site and revivify and water it; the last three operations are done simultaneously. Dust troubles have been entirely eliminated by a simple device, and with ordinary care the oxide is projected with a uniform moisture content of 15 p.ct. This type of plant is excellent for the handling of oxide, and deserves wider adoption.

Former Method of Working.

The former method of working was orthodox. The gas entered the purifiers at a temperature between 65° and 70° Fahr. Quarried oxides and bog ores were used, being placed in the boxes in three layers 9 in. thick. The grids were of a usual pattern, 3 ft. 6 in. by 1 ft. 8 in., with 30 p.ct. of free space. The primary boxes were worked on the forward rotation principle, the order being changed once per week, the first box becoming the last after changing. When a box was emptied, the oxide was dug out by pick and shovel, thrown out at the side of a box, and lifted by hydraulic crane through hatchways to the revivifying floor, where it was laid out and crushed by manual labour, being afterwards turned over as necessary to complete revivification. With the type of oxide then in use, at least four foulings were necessary to attain saleable sulphur content in the spent oxide. In these circumstances the capacity of the oxide purifying plant was limited to 15 million c.ft. per day.

The difficulties of the former method of working may be summarized as follows: Slow fouling of the oxide; limited capacity of the plant; excessive handling of the oxide; large number of grids and bearer bars; and naphthalene troubles. Regarding the last objection, the only way to avoid considerable additional distribution expenses and annoyance to con-

sumers was by installing naphthalene extraction plant on a very expensive and comprehensive scale.

COSTS OF FORMER WORKING.

The costs of former working will be calculated on the present annual make of 4800 million c.ft. and at present prices of materials and labour. It is assumed that it would be possible to purify this volume when using quarried oxides or bog ores, but it is probable it could not be attempted with the present purifier capacity and these particular oxides. Heavy capital expenditure on additional plant would be necessary to give the same margin of safety and reliability obtained by using oxide "A" in the existing plant.

Summary of Costs—Quarried Oxide.

Item.	Annual Sum.	Pence per 1000 C.Ft.	Pence per Therm.
	£ s. d.		
Changing boxes	3348 0 0	0·1674	0·0352
Crushing, laying out, and turning	3977 0 0	0·1988	0·0419
Grids	369 0 0	0·0185	0·0039
Bearer bars	217 12 0	0·0109	0·0023
"Bottoming" of boxes	49 6 0	0·0025	0·0005
Loading and unloading	196 17 0	0·0098	0·0021
Engine and boilermen	600 0 0	0·0300	0·0063
Maintenance and repairs	800 0 0	0·0400	0·0084
Total costs	£9557 15 0	0·4779	0·1005
Deduct net credit for oxide	2254 8 0	0·1127	0·0237
Net costs of purification	£7303 7 0	0·3652	0·0768

Summary of Costs—Bog Ores.

Item.	Annual Sum.	Pence per 1000 C.Ft.	Pence per Therm.
	£ s. d.		
Changing boxes	3,836 5 0	0·1918	0·0404
Crushing, laying out, and turning	2,244 0 0	0·1122	0·0236
Grids	369 0 0	0·0185	0·0039
Bearer bars	217 12 0	0·0109	0·0023
"Bottoming" of boxes	49 6 0	0·0025	0·0005
Loading and unloading	224 12 0	0·0112	0·0024
Engine and boilermen	600 0 0	0·0300	0·0063
Maintenance and repairs	800 0 0	0·0400	0·0084
Total costs	£8,340 15 0	0·4171	0·0878
Add net cost of oxide	2,397 12 0	0·1199	0·0252
Net cost of purification	£10,738 7 0	0·5370	0·1130

It will be noticed that the greater cost compared with quarried oxide is due to the higher cost of new oxide, of which a much larger tonnage is necessary owing to the very high moisture content.

PRESENT METHOD OF WORKING.

No alteration has been made to the flow of gases. The boxes are charged with oxide "A" in one layer 2 ft. 8 in. deep in the primary boxes, and in three 9-in. layers in the catch boxes.

The internal equipment is now considerably simplified in the primary boxes. The grids are of the same pattern as previously used, but one tier only is needed in each box. Consequently only one bottom set of bearer bars is necessary to support the grids. Some of the long tee bars of the top layer, however, are left in to facilitate filling and levelling operations. Cast-iron supporting stools for the bearer bars have been entirely superseded by short wooden posts, slotted at the top to take the stalk of the tees. The simplification of internal equipment is due solely to the adoption of oxide "A." If other oxides are used in one layer 2 ft. 8 in. thick, they form a mass so compact that excessive back-pressure is thrown.

Concentration on the problem of supporting the oxide in the most efficient manner possible has led to still further improvement. An experiment has recently been carried out in one box of using grids with much larger gas spaces—45 p.ct. free space compared with 30 p.ct. for the usual type—and covering these grids with hessian cloth. The motive is further to reduce back-pressure, to reduce the cost of grids, to eliminate cleaning of grids, and to prevent oxide falling through to the bottom of the box. The cost of this type of grid is £37 per box as compared with £46 for the usual type. The hessian cloth costs 55s. per box, and present indications are that it will last quite two years, and it does not suffer any damage when a box is changed. The hessian is peeled off the grids after the oxide is removed, and replaced by a spare roll of cloth. The cloth removed is hung up and shaken when dry. Any additional work entailed is more than offset by the saving in grid cleaning. It is estimated that an additional saving of £122 per annum would be effected by adopting this method in all boxes.

WORKING ROUTINE.

The primary boxes are arranged in fours round centre valves and are worked on the forward rotation system, the order being normally changed once per week, when the first box becomes the last. With oxide "A" the rate of sulphur absorption is so regular that the sulphur content of the oxide in any primary box can be accurately estimated, and the changing of boxes can be done by routine. This factor is of great importance in maintaining six equal streams of gas, in getting the purifiers in good condition for the winter load, and in obviating naphthalene troubles. Routine changing would not be possible if the six streams were not equal, and the checking of some valves to attain this end would automatically cause an increase of back-pressure. The activity of a box can be readily gauged by its inlet and outlet temperatures and pressures, and when it becomes inactive in all positions of the rotation system it is emptied and changed. It is, however, very seldom necessary to change a box out of its turn.

The percentage of sulphur in oxide "A" after the first fouling varies between 40 and 48. If the figure is over 46 p.ct., it is sold as spent. It is more profitable to sell spent oxide at 46 p.ct. sulphur and 6½d. per unit than to return it to a box, increase the sulphur content to 50 p.ct. or more, and sell at 7d. per unit. Of the oxide "A" used, 30 p.ct. is spent after the first fouling, and the remaining 70 p.ct. is always spent after the second fouling.

For the revivification *in situ* air is admitted to the gas stream at the outlet of the ammonia washers by means of an air compressor in the proportion of about 2 p.ct. of the gas made. The percentage of oxygen in the gas at the inlet and the outlet to the purifiers averages 0·6 and 0·3 respectively.

As an adequate temperature is essential to ensure efficient working, the temperature of the gas at the inlet to the purifiers is maintained between 65° and 70° Fahr. throughout the year. This is effected by exact control of the quantity of water supplied to the final water-tube condensers. These condensers are fitted with "Arca" regulators on the water supplies, and the outlet gas can be maintained at any required temperature by the simple adjustment of a screw. The rise in temperature of the gas in passing through the turbo exhauster, which amounts to about 18° Fahr. with an average make of gas, is, of course, allowed for. This temperature rise can be increased, if necessary, by slightly opening the by-pass valve and increasing the speed of the exhauster. This is not economical, but may serve in an emergency.

NAPHTHALENE AND CHANGING OF CATCH BOXES.

It is impossible to maintain an equal temperature in every box of a large installation, but, if the temperature of the gas leaving the primary boxes does not differ more than a few degrees from the temperature at the inlet box, little, if any, naphthalene can be deposited in the primary boxes. It is claimed that, with the oxide now in use providing uniform activity during the period it is in use, combined with routine changing, these conditions are largely attained.

When the catch boxes are reached, however, the temperature falls considerably in the winter months owing to the low atmospheric temperature and the comparative absence of chemical action. These conditions favour the deposition of naphthalene in a position which offers a simple remedy—the changing of catch boxes every spring. In this way the seasonal rise in temperature in the spring, which is immediately reflected in the temperature of the catch boxes, is prevented from volatilizing naphthalene and carrying it forward to the distribution system, where the temperature rise lags some weeks behind the rise in atmospheric temperature.

The expense of changing the catch boxes is not great, and is amply justified by resultant freedom from naphthalene troubles. It could be soundly argued that the cost of changing catch boxes should not be charged to dry purification. It is certain that a naphthalene washing plant subsequent to the purifiers would incur greater annual expense. The cost of changing will, however, be included in the present working costs of purifiers.

For works carbonizing coal in continuous vertical retorts, it can be safely stated that, if oxide "A" is used in the purifiers, and the catch boxes are changed every spring, no further provision against naphthalene troubles is necessary.

Summary of Present Costs, Oxide "A."

Item.	Annual Sum.	Pence per 1000 C.Ft.	Pence per Therm.
	£ s. d.		
Changing boxes, crushing, and revivifying	1925 12 0	0·0963	0·0203
Changing catch boxes	61 10 0	0·0031	0·0007
Grids	183 0 0	0·0092	0·0019
Bearer bars	124 4 0	0·0062	0·0013
"Bottoming" of boxes	49 6 0	0·0025	0·0005
Loading and unloading	204 8 10	0·0102	0·0021
Engine and boilermen	600 0 0	0·0300	0·0063
Maintenance and repairs	800 0 0	0·0400	0·0084
Total cost	£3948 0 10	0·1974	0·0415
Deduct net credit for oxide	749 10 0	0·0375	0·0079
Net cost of purification	£3198 10 10	0·1600	0·0336

Economy of Present Method of Working.

Below is given a summarized comparison of working costs under former and present method of working.

Costs.	Former Method.		Present Method. Oxide "A."
	Quarried Oxide.	Bog Ore.	
Annual cost . . .	£7303	£10,738	£3198
Cost per 1000 c.ft. . .	0·3652d.	0·5370d.	0·1600d.
Cost per therm. . .	0·0768d.	0·1130d.	0·0336d.

Present annual saving compared with quarried oxide = £4105
" " " " " bog ore = £7540

All the above costs are based on an annual make of 4800 million c.ft., giving a purifier capacity in primary boxes of 0·38 sq. ft. per box per 1000 c.ft. of gas per maximum day of 22 million c.ft.

It is quite certain, however, that this make of gas could not be purified in the existing plant if quarried oxide or bog ore were used. It has been shown that 144 and 165 changes of boxes respectively would be necessary per annum, of which at least 100 would be necessary during the winter half-year, or four changes per week. Obviously, such working would be impossible.

It would be necessary to increase the purifying plant by at least one-third—*i.e.*, eight primary boxes and two catch boxes to eliminate H_2S with these oxides. The cost of this addition to the plant, including connections and the necessary buildings, would be not less than £50,000. Allowing interest and depreciation at the low figure of 10 p.ct. per annum, an additional annual charge would be involved of £5000.

The forcing of the gas through the purifiers involves a large annual expenditure in steam at the exhauster. The following are actual back-pressures thrown by the purifiers when passing 13·1 million c.ft. per day, which is the average daily make throughout the year: Oxide "A," 5½ in.; quarried oxide, 17½ in.; bog ore, 15½ in. The excess back-pressure of 12 in. and 10 in. with quarried oxide and bog ore requires an additional steam consumption of 450 lbs. and 400 lbs. per hour respectively. With steam at 2s. 3d. per 1000 lbs. (all-in cost), the annual additional cost would be £443 with quarried oxide and £394 with bog ore. These excess steam consumptions are based on the latest type of turbo exhauster working condensing; with less efficient exhausters the steam bill would be proportionately higher.

The use of oxide "A" has had a considerable share in the elimination of naphthalene troubles, for reasons previously stated. It would be impossible to assess accurately the annual amount saved in this respect, but a figure of £1000 per annum would certainly be modest.

Estimated Annual Saving.

From the above considerations it is calculated that the purification of 4800 million c.ft. of gas per annum by means of quarried oxide would cost about £10,600 per annum more than present costs and £14,000 per annum more with bog ore. These sums would include interest on capital and depreciation of additional plant, which would not be shown on a purification balance-sheet as usually drawn up; nevertheless, such an additional expenditure would be incurred.

Conclusions.

(1) The use of a specially prepared oxide results in the following economies:
  (*a*) At least 30 p.ct. increased capacity of dry purification plant.
  (*b*) Reduced working costs, owing to such oxide requiring fewer changes to become spent.
  (*c*) Simpler and cheaper internal equipment of boxes.
  (*d*) Lower steam consumption by exhausters.
(2) Efficient routine organization of operations magnifies the economies tabulated in (1) and also ensures comparative freedom from naphthalene troubles.
(3) Mechanical handling of oxide, especially crushing, results in a very great saving over manual labour in large works.
(4) A blowing plant supplies the need on a large works for a portable long-distance oxide conveyor and distributor with the added advantage of immediate revivification and perfect hydration.

As corollaries to the above it is further concluded that:
(1) Orthodox purification with natural oxide is not the cheapest method.
(2) The usual rules for determining the maximum capacity of purifiers do not apply to all types of oxide.
(3) Naphthalene troubles may be aggravated or alleviated by the method of working the purifiers.

Recommendations.

There is need of further research on, and experiment with, prepared oxides, particularly in connection with physical characteristics. It has been proved that it is possible artificially to prepare material yielding great economies, and that the initial price within a wide margin need not control the selection of oxide.

The possibility of the commercial success of a number of plants in selected centres for the extraction of sulphur and cyanide from spent oxide, with the return of the prepared oxides to the gas-works, requires consideration on a national basis. In this connection the market for sulphuric acid and cyanides would determine the results. The market for cyanides is now favourable, and there are indications that it will further improve. Under present market conditions a content of 4 p.ct. or over of prussian blue pays to extract.

It is the considered opinion of those who have thoroughly investigated the matter that the cyanide content of spent oxide is more influenced by the treatment of the gas subsequent to carbonization than by the actual type of carbonization plant itself. As this is mainly a matter of the method of gas condensation and the circulation of ammoniacal liquor, combined with the position of admission of air, it is under the control of the works concerned. It would therefore appear that careful attention to wet purification plant with a view to minimizing cyanide absorption in that position and allowing the cyanide to be absorbed in the purifiers would not only be profitable but might give better ultimate economic results than could be obtained by the installation of a cyanide extraction plant prior to the wet purification plant. In addition, the minimizing of cyanide content of the ammoniacal liquor results in less harmful waste ammoniacal liquors for sewage purification.

It is felt that the importation of thousands of tons of more or less inferior material, and its subsequent disposal by sulphuric acid manufacturers as waste, is unscientific and wasteful. With suitable centralized extraction plants this could be avoided and the oxide returned to the gas-works in a state which would increase the capacity of the purifiers by at least 30 p.ct. and enable the internal equipment of purifiers to be considerably simplified.

Recommendations for reconstruction of dry purification plant to improved designs and the installation of modern mechanical devices to economize labour, such as portable oxide breakers, oxide grabs, &c., do not come within the scope of this paper which has attempted to show what can be done when the opportunities for reconstruction are not available, and the installation of the above mechanical devices is only limited.

Discussion.

The President (Mr. A. R. Myhill) said that the author's conclusion that the physical properties of the oxide were as important as, if not more important than, their chemical composition was worthy of the closest consideration. The contribution of Mr. Hawthorn showed how small a margin of gain might eventually be made to yield a substantial profit. He would like to know if the author had any experience regarding the admission of air to the purifiers. This method of admitting air was an important one, particularly in vertical steaming practice. The delivery of oxide by air pressure was new to him. He thought that full regard should be had to the question of the use of oxide "A" in the elimination of naphthalene troubles. He would like to know why the oxide that was removed from the bottom of the boxes was useless.

Mr. W. Macnaughton (Wolverhampton) referred to the use of 6-ft. boxes. If the room occupied by the oxide was only 2 ft. 8 in. it appeared that much valuable space was lost. Since the introduction of verticals at Wolverhampton, they had not experienced any naphthalene troubles.

Mr. G. C. Pearson (Engineer, Windsor Street Works, Birmingham) pointed out that purification methods had remained practically on the original lines, with the exception that lime had been abandoned. Various attempts had been made to introduce more scientific methods, but they had not been satisfactory. Ammoniacal liquid purification was discontinued in Birmingham owing to the losses of ammonia. Purifying methods, as ordinarily accepted, had the disadvantage that they required a large amount of space. The purifying area could, however, be substantially reduced by increasing the depth of the boxes. Bog ore was notoriously wet, and if the percentage of moisture was 40 to 50, there was not much contraction in the boxes. Oxide was best broken by a portable breaker.

Mr. Hawthorn, replying, pointed out that the capacity of purifiers was of the utmost importance in working up oxide to saleable strength with a minimum of labour. In view of the large ground space occupied by purifiers, and the capital cost, it was often necessary to increase the duty of existing purifiers. Air for revivification *in situ* was best admitted at the inlet to the purifiers, though this was not the most convenient method. The cyanide content of liquor or oxide depended largely on the position of air admission. The idea of admitting air to individual boxes was rather impracticable, and would be of no advantage when working boxes on a rotation system. Although it was generally understood that vertical gas gave immunity from naphthalene troubles, there was a surprising difference in the naphthalene content of gas from various plants of that type. The use of hessian cloth depended upon the oxide in use. With very hard oxide, necessitating the use of picks, damage to the cloth would result; but with a fairly loose oxide, and using pneumatic diggers, there need be no damage. There was no danger from sparks from such diggers. If proper precautions were taken, there was no chance of an explosive mixture in boxes while men were working in them. The return of oxide containing 46 p.ct. sulphur to a box, and increasing the sulphur content to obtain a further penny per unit, might pay in plant with large capacity; with limited capacity it was not advisable. Backward rotation was perhaps advisable if there were no catch boxes; otherwise, forward rotation probably gave more uniform temperatures and better results.

Register of Patents.

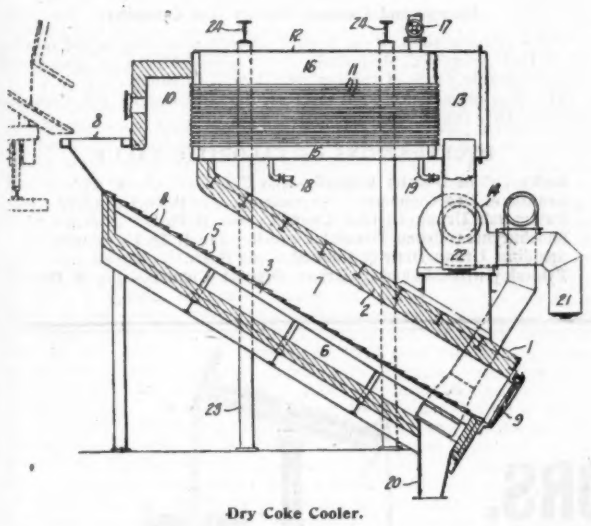
Dry Coke Cooling.—No. 310,283.

HUMPHREYS & GLASGOW, LTD., of Victoria Street, S.W. 1 (Assignees of HAUG, J. S., of Philadelphia).

No. 12,435; April 22, 1929. Convention date, April 21, 1928.

In the accompanying diagram, 1 is the casing of an inclined coke container, 2 is the refractory lining of the container, and 3 is the sloping wharf which supports the coke being cooled. This wharf is spaced as shown from the top and bottom of the casing, and is formed by the under-lapping plates 4. These under-lapping plates have between them the ports 5 leading from the space 6 below the wharf to the space 7 above it.

As above stated, the wharf serves as a support for the hot coke which is charged into the container through the opening 8, this opening being provided with water sealing or other means to effect a gas-tight closure. The coke, when cooled, is discharged through the door 9. This door is also provided with a gas-tight closure. The upper space 7 above the wharf communicates with the flue 10, which is in open communication with the tubes 11 of the firetube boiler 12. These tubes also communicate with the flue 13 which is connected to the intake side of the fan 14. The outlet side of the fan is connected with the interior of the casing 1 below the wharf. The boiler 12 is provided with a water space 15 and a steam space 16. 17 is a steam offtake, and the necessary feed water inlet is indicated at 18 and the blow-off pipe at 19.



Dry Coke Cooler.

The boot leg 20 at the base of the space 6 of the container serves as a dust collector. Other dust collectors may be provided in the fan connections as indicated at 21 and 22.

The casing and the wharf are inclined somewhat more steeply than the angle of repose of the coke, thus allowing the coke when charged to slide in gently over the wharf and lie in a body of relatively even depth and to slide out gently when the discharge door is opened, thus minimizing the amount of breakage.

In operation hot coke from ovens or retorts is charged through the charging opening on to the wharf 3, the discharge door 9 being closed. The opening 8 is then closed and the fan 14 is operated. This forces the air in the container, boiler, and connections through the hot coke, this air being consumed to products of combustion which are re-circulated through the boiler and the hot coke, abstracting heat from the coke and giving it up to the boiler water to raise steam. This re-circulation is continued until the coke is sufficiently cooled. The fan is then shut off and the discharge door is opened. The coke slides out and is removed to storage or use.

Pressure Equalizer for Gasholders.—No. 325,345.

BOTT, T. L., of Wellington, Shropshire.

No. 51; Jan. 1, 1929.

This invention relates to telescopic gasholders, and the object is to prevent the escape of gas from the holder occurring owing to gas "blowing" the seal in the cup of the holder. The invention provides for a means or device which will equalize the pressure in the "dip" chamber of a descending lift of a gasholder with that in the body of the holder. The pressure equalizer consists of a hollow horizontally disposed member or bearing affixed to the underside of the cup and at right angles thereto. In the bearing there is rotatably mounted a plain, round, tubular connection or trunnion which, at each end, terminates in a tube, of convenient length, which at its free end is open. These tubes extend, the one into the "dip" chamber to constitute a "dip" tube, the other into the holder to constitute a "draining" tube, and to the latter there is affixed an air vessel or float.

While submerged, the equalizer is always in vertical position, and as the gasholder rises, it carries the equalizer up and out of the tank water. The equalizer tilts from its vertical position into a position more or less downwardly inclined from the horizontal, and thereby drains out any water contained in the equalizer.

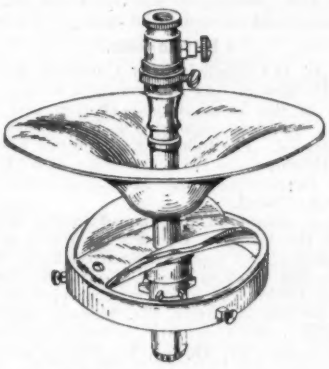
On the gasholder descending, the float carried by the equalizer, on coming into contact with the tank water, causes the equalizer to swing in its bearing into a vertical position and with the open ends of the tubes uppermost, the outer tube being in the compressed gas or "dip" chamber and with its open end at or about the level of the water, so that gas from the compressed gas chamber traverses through the equalizer into the normal pressure holder.

Inverted Gas Burner.—No. 325,290.

BROMLEY, H. H., of Farringdon Road, E.C.

No. 33,083; Nov. 17, 1928.

The object of this invention is to provide an inverted incandescent burner with deflector devices which add to the attractive appearance of the burner and at the same time afford adequate protection for the



Bromley's Lighting Burner.

burner parts and pendant against corrosion and over-heating by the ascending gases. The accompanying drawing gives an idea of the appearance of the burner.

Gas Ovens.—No. 325,221.

FLAVEL, P., of Leamington.

No. 33,098; Nov. 12, 1928.

A gas oven is so arranged that the products of combustion after leaving the oven at the top thereof, at or near the front, are caused to sweep the top and back of the oven chamber successively, and to pass out of a discharge outlet located at or near the level of the bottom of the oven.

Gaslighter.—No. 325,282.

PAYNE, S., of Shoreham-by-Sea.

No. 33,699; Nov. 16, 1928.

The following claims are made for this invention: A gaslighter comprising a hollow casing provided with a file at one end and a pivoted member carrying a flint in contact with the file, a lever connecting the pivoted member with a hollow operating member slidable transversely in the casing, and a curved spring extending from end to end of the operating member and pressing upon the end of the lever substantially as described.

A gaslighter in which the flint is held in contact with the file by a spring-pressed rod having intermediate its ends a bent part projecting through a slot in the flint holder by means of which the rod can be retracted for replacing the flint, the bent part being adapted to engage a recess in the slot so as to hold the rod in the retracted position.

Applications for Patents.

[Extracted from the "Official Journal" for March 12.]

Nos. 6873—7682.

CHUR, E.—"Dry seal for disc gasholders." No. 6914.

GADD, A.—"Waterless gasholders." No. 7451.

GAS LIGHT AND COKE COMPANY.—"Rubber tubing." No. 6972.

GAS LIGHT AND COKE COMPANY.—"Catalytic oxidation of toluene, &c." No. 6986.

GAS LIGHT AND COKE COMPANY.—"Conversion of hydrocarbons." No. 7639.

LODGE, L. (LODGE-COTTRELL, LTD.).—"Liquid seals for gas chambers." No. 7131.

MIDLAND BRASS FITTINGS COMPANY.—"Plug cocks for gas." No. 7453.

MOORE, G.—"Hot water coils for gas or electric cookers." No. 6889.

MORRIS, G. R.—See Midland Brass Fittings Company. No. 7453.

Parliamentary Intelligence.

[From Our Special Correspondents.]

House of Lords.

Special Orders.

Special Orders made on the application of the Bideford Gas and Coke Company, Ltd., and the Oxford Gas Light and Coke Company have been laid before the House and referred to the Special Orders Committee.

Private Bills.

The South Staffordshire Mond Gas Bill, having been passed by the Examiners, has been read a second time and referred to a Committee.

House of Commons.

Special Orders.

The Special Order made on the application of the Grange and Cartmell District Gas and Water Works Company has been approved. Plans have been deposited in connection with the Yorktown (Camberley) and District Gas and Electricity Order.

Special Orders made on the application of the Bideford Gas and Coke Company, Ltd., and the Oxford Gas Light and Coke Company have been presented and ordered to lie upon the Table of the House.

Private Bills.

The petition of the Sheffield Gas Company against the South Yorkshire and Derbyshire Gas Bill has been withdrawn.

The petitions of the Stretford and District Gas Board and the Altrincham Gas Company against the Manchester Extension Bill have been withdrawn. The following Committee has been appointed to consider the Brighton and Hove Gas Bill: The Chairman of Ways and Means, the Deputy-Chairman, Mr. Charles Brown, Col. James, and Sir Frederick Liddell.

The anticipated debate on the clause dealing with the Gardner gas contract in the Glasgow Corporation Bill was to have taken place last Wednesday, but was postponed owing to the adjournment of the House on the death of Earl Balfour. No date has yet been fixed for it to be taken. A motion for the rejection of the Bill has been put down by Mr. Wheatley, Mr. Maxton, and Mr. Kirkwood, and an instruction to the Committee to leave out Clause 54 by Mr. Hardie, Mr. McKinlay, Mr. Thorne, Mr. Dukes, and Mr. Hayday.

Coal Mines Bill.

The two amendments to Clause 3 of the Bill for the protection of gas, electricity, and water supply undertakings were not selected by the Chairman for discussion, owing, it is understood, to the fact that neither of the opposition parties were prepared to give them official support. It is believed, however, that they may be again put down in an amended form on the Report Stage of the Bill.

Gas Acts (1920 and 1929) Orders.

SPECIAL ORDERS.

Bath Gas Company.

To empower the Company to purchase the undertakings of the Chippenham Gas Company and of the Corsham Gas Company, Ltd., to authorize the use of scheduled land for gas purposes, &c.

East Hull Gas Company.

To authorize the use of scheduled land for gas purposes, and the purchase of additional land.

Watford and St. Albans Gas Company.

To provide for the transfer to the Company of the undertaking of the Elstree and Boreham Wood Gas Company, Ltd., for stock consolidation and conversion, and for other purposes.

Yorktown (Camberley) and District Gas and Electricity Company.

To provide for the transfer to, and vesting in the Company of, the undertaking of the Henley-on-Thames Gas Company, to authorize the use of scheduled land for gas purposes, &c.

SECTION 6.

Grange and Cartmel District Gas Company.

The Company shall, from April 1, charge according to the number of B.Th.U. supplied, and shall on or before March 21 give notice of the calorific value of the gas they intend to supply.

The maximum price in respect of gas supplied by the Company shall be 16d. per therm.

DECLARATIONS OF CALORIFIC VALUE.

Barry Urban District Council.—450 B.Th.U. (April 1.)
Grantham Gas Company.—Alteration to 430 B.Th.U. (July 1.)
Rawmarsh Urban District Council.—500 B.Th.U. (April 1.)
Shoeburyness Urban District Council.—525 B.Th.U. (April 1.)
Spalding Urban District Council.—460 B.Th.U. (April 1.)
Tyldesley-with-Shakerley Urban District Council.—475 B.Th.U.

BRADDOCK'S

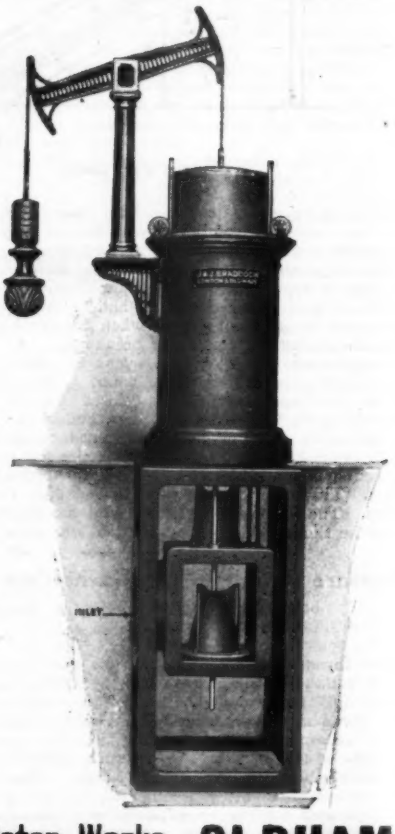
GAS STATION GOVERNORS.

MOST COMPACT AND CONVENIENT.

Valves accessible upon removal of side-plate of Valve Box, without taking out the bell.

Long and extensive use has proved the efficiency and reliability of these governors.

NO FLOATS TO GET WATERLOGGED.



J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, OLDHAM,
Telegrams: "BRADDOCK, OLDHAM." Telephone No. 815.
AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E. 1.
Telegrams: "METRIQUE, LAMB LONDON." Telephone No. 2412 HOP.

Gas Companies' Results in 1929.

Growing Popularity of Gas in Home and Factory.

ALLIANCE AND DUBLIN.

The accounts of the Alliance and Dublin Consumers' Gas Company for the half-year ended Dec. 31 last show a profit on the revenue account of £72,004, and after providing for interest on debenture stock, and temporary loans, there remains the sum of £63,769, to which must be added the sum of £24,057, being the balance brought forward from the last account, and a credit from income-tax amounting to £392, making a total of £88,219. The Directors recommend the declaration of a dividend on the consolidated ordinary stock of the Company at the rate of £7 12s. 6d. p.ct. per annum (this being the maximum statutory dividend permissible under the sliding-scale provisions, when gas is sold at the rate obtaining during the half-year concerned), *less* income-tax, which will absorb the sum of £59,165, after which a balance of £29,054 will remain to be carried to the next account.

ALNWICK.

At the Annual Meeting of the Alnwick Gas Company—Mr. R. Kyle presiding—it was reported that the output of gas for the year exceeded the previous year's record by 1¾ million c.ft. Dividends declared were 12½ p.ct. on the "A" stock, 9½ p.ct. on the "B" stock, and 6 p.ct. on the "C" stock.

BOGNOR.

The extraordinary progress the Bognor Gas and Electricity Company has made in the last twenty years was shown by some interesting figures given to the shareholders at the Annual Meeting of the Company, which was held at the Offices in Argyle Road, Bognor, on Feb. 28. In the unavoidable absence owing to indisposition of the Chairman, Mr. J. G. Denton, the meeting was presided over by Mr. T. N. Ritson. The Chairman proposed the adoption of the Directors' report, which was as follows: After providing for interest, interim dividend (paid for June, 1929, half-year), and all other charges, the amount standing to the credit of profit and loss account is £15,999. The Directors recommend the confirmation of the interim dividend for June, half-year, and the payment of a final dividend, making the authorized rates for the year as follows: £8 p.ct. per annum upon the original "A" stock, £9 4s. p.ct. per annum upon the original "B" stock, £8 p.ct. per annum upon the additional "A" stock, £7 p.ct. per annum upon the new consolidated stock. This final dividend will amount to £5617, leaving a balance of £10,381 to the credit of profit or loss account, as shown in the statement. Most satisfactory increases in the consumption of both gas and electricity continue, over 10 p.ct. and 37 p.ct. respectively have been recorded in excess of the sales during 1928. A duplicate carburetted water gas plant has been installed at the Bersted Works to meet the increasing demands for gas. New gas mains have been laid to afford a supply in the rapidly developing districts of Aldwick and Middleton. In moving the adoption of the Directors' report and statement of accounts, the Chairman said: The sum of £2161 has been expended during the year on new plant, &c., a portion of which is on account of duplicating the carburettor water gas plant. New mains and service pipes have cost £3739, mainly due to the extension of mains into Middleton and Aldwick. The amount spent on new meters amounts to £2063. Depreciation of meters and stoves amounts to £639, leaving the net expenditure for the year on capital account at £7324. The lengths of main laid during the year are as follows: 3189 yards of 8-in., 1046 yards of 6-in., 3172 yards of 4-in., and 140 yards of 3-in., making a total of 7547 yards, or nearly four and one-third miles. Coal, oil, and coke have cost £1587 in excess of 1928, due to the fact that more gas has been made (169,410,000 c.ft., as against 153,246,000 c.ft., or an increase of 16,164,000 c.ft.). There is an increase of £504 in rates and taxes, brought about by the revised assessment of the Company's property. The revenue from sales of gas is somewhat increased, owing to the very satisfactory increase in the output of over 15 million c.ft., or over 10 p.ct. This increase amounts to £2741, notwithstanding that the price of gas was reduced from March 31 last. This reduction means a concession to the consumers of £952 for the nine months. The profit on gas revenue account is £10,235, compared with £8399 for 1928, which, I venture to think, will be regarded as very satisfactory.

DOUGLAS.

The ninety-fifth Annual General Meeting of the Douglas Gas Light Company was held in the Company's Offices, South Quay, on March 3—the Chairman, Mr. C. H. Kay, J.P., presiding. The Directors' report for the year ended Dec. 31 last showed that the net profit amounts to £10,548, being an increase of £516 on last year. The Directors announced a reduction in the price of gas by one-fifth of a penny per therm (equal to 1d. per 1000 c.ft.), making the new price 10·8d. per therm, or 4s. 6d. per 1000 c.ft., to take effect as from Jan. 1, 1930. An interim dividend of 27s. 6d. per share was paid on Sept. 2 last, and, including the balance brought forward, there was now available the sum of £10,219. The Directors recommend that a final dividend for the year of 42s. 6d. per share be paid, and the balance carried forward to the next account. The Chairman said, in moving the adoption of the report and accounts for the year ended Dec. 31 last: On the credit side of the account, the receipts from the sale of gas show an increase, while tar and coke show a decrease, these latter, as a rule, following on the price of coal. Adding the balance brought forward from last year, £3738, and deducting the interim dividend paid in September, £4067, there is available for distribution the sum of £10,219, out of which the Directors recommend the payment of a final dividend of 42s. 6d. per share, which will absorb £6285, leaving £3933 as the balance to be carried forward to next account. The final dividend was 2s. 6d. per share more than last year, and will add £370 to the dividend charge.

EAST GRINSTEAD.

Satisfactory progress was reported at the Ordinary General Meeting of the East Grinstead Gas and Water Company, on Feb. 26, under the Chairmanship of Mr. W. H. Hills (Chairman of the Directors). The report stated that after payment of the interim dividend, interest on debentures, and other fixed charges, the profit and loss account showed a balance of £10,403. The Directors recommended payments for the half-year ended Dec. 31 of £5 p.ct. on the original "A" stock and "A" shares, and £3 10s. p.ct. on the "B" and "C" shares, which made £10 p.ct. and £7 p.ct. respectively for the year; carrying forward £7541—an increase of £119 on the previous year. Moving the adoption of the report, the Chairman said the capital account was now £114,420—an increase of £3160 during the year—this being brought about by extensions of gas and water mains. There were now about two miles of mains, and gas and water consumers numbered 2739 and 2607 respectively. For the first time in the history of the Company 100 million c.ft. of gas had been made in the year, and gas sales showed an increase of 4¼ million c.ft., or 4·7 p.ct. This increasing consumption made further gasholder storage necessary, and a scheme was in hand for the erection of a new holder, at a cost of £12,000. It would be built of British material and by British labour, and a grant of interest at the rate of 5 p.ct. on the total amount, equalling £1800 for a period of 3 years, was guaranteed by the Treasury.

LEATHERHEAD.

The Ordinary General Meeting of the Leatherhead Gas and Lighting Company, held on March 7, was the first meeting of the shareholders to take place in the Company's new offices in North Street, Leatherhead. Comments upon the excellence of the new premises, which comprise showrooms, workshops, and store-rooms, as well as offices, were made during the meeting. Among those present were Dr. Laurence Potts (Chairman) and Sir Arthur Duckham, G.B.E., K.C.B. Moving the adoption of the report, Dr. Potts drew attention to the statement therein that the year 1929 showed an average increase in the sale of gas of 7 p.ct. This is a higher rate than most gas companies are able to report, said Dr. Potts. The major portion of this increase was obtained in the first three months of the year, which has an unusually cold period. The increase in sales for that quarter reached the very high rate of 17½ p.ct. This period was, however, followed by a warm summer and a mild and stormy autumn and winter, when the increase fell to 3 p.ct. The new mains and services have cost the Company £10,172. The Company have 78 miles of mains and 4872 customers. In addition to the outlay on mains, more capital has had to be spent at the gas-works and for the completion of the new offices and showrooms and stores. At the works, an additional boiler and exhauster have been installed; also a new station meter and the new well has been completed. The well yields an abundant supply of water, and compared with using the town supply, it shows a saving of several hundred pounds per annum. To provide for all the expenditure occasioned by these works, the balance of the ordinary capital, £19,917, had been issued in 6 p.ct. irredeemable preference stock, and the remainder of the loan capital, £25,000, was now on offer as 5½ p.ct. debenture stock redeemable at the Company's option between 1945 and 1955. Over £10,000 of this stock had been placed. At the end of March, said the Chairman, a reduction of one-fifth of a penny per therm was made in the price of gas, and a similar reduction of one-fifth of a penny at midsummer. Though the reduction to the individual consumer may not seem great, yet for only the portion of the year affected, it cost the Company £759, which means about £1300 for a whole year.

NORTHWICH.

The Annual Meeting of the Northwich Gas Company was held on Monday, Feb. 24—Mr. C. T. Eachus (Chairman) presiding. In moving the adoption of the report and balance-sheet, the Chairman said the year's working had turned out very satisfactory, and reflected great credit on the management. During the year the quantity of gas sold was 107,413,000 c.ft., as against 99,483,000 c.ft.—an increase of 7,930,000 c.ft. New apparatus had been fixed during the year—namely, 151 cookers, 27 fires, 236 wash-boilers, 11 geysers, &c. Residual products showed a decrease, principally due to the drop in price of tar, and the Chairman stated he hoped to show better results this year. The revenue account showed a profit of £7662, and after payment of interim dividends, interest on loans and reserve fund, there was, with the addition of the balance brought forward, a disposable balance of £7708. Mr. W. D. Hesketh seconded, and supported the Chairman's remarks. The Chairman proposed, and Mr. J. Moreland seconded, that dividends be declared at the rate of 4 p.ct. per annum on the preference shares (free of income-tax), 5 p.ct. per annum on the preference stock (*less* income-tax), and 7 p.ct. per annum on the ordinary stock (*less* income-tax) for the past half-year, which would absorb £2341, making, with interim dividends, 4 p.ct., 5 p.ct., and 6 p.ct. for the whole year respectively. There had been transferred to contingency fund £1500 and to reserve fund £1000, leaving a balance of £2867 to be carried forward. The Chairman proposed that the Directorate be reduced from seven to six members, and stated that he and his colleagues thought that number was large enough to carry on the work, and Mr. Rogerson seconded. On a show of hands the resolution was carried, after

which a poll was demanded, and the Chairman again declared the resolution carried by 2130 votes. He also said that the Directors would, if necessary, in future, use their power of co-option.

PETERBOROUGH.

Increased receipts and profits were reported at the Annual Meeting of the shareholders of the Peterborough Gas Company on Feb. 18—Mr. A. J. Paten presiding. The Directors, in presenting their report and statement of accounts, said: "Interim dividends of 5 p.ct. per annum on the new preference "A" shares, and 7½ p.ct. per annum on the consolidated ordinary stock, both *less* income-tax, were paid in August last for the half-year to June 30, 1929, and we recommend the payment of dividends at the same rates for the half-year ended Dec. 31, 1929. The payment of such dividends will absorb the sum of £3525, leaving a balance of £11,198, which we recommend shall remain to the credit of the profit and loss account." The capital account showed receipts of £152,345, and a credit balance of £13,371; the revenue account receipts of £83,282 (including £62,063 by sale of gas, £1399 by rents, £14,726 by residual products, and £5084 by gas fittings), and payments of £67,088 (the main item being £50,897 for the manufacture and distribution of gas), the total profit being £16,194. The following balances were carried forward on other accounts: Reserve fund, £9519; renewal fund, £2402; special purposes fund, £5947. During the year 21,466 tons 18 cwt. of coal had been received, and 19,846 tons 18 cwt. carbonized. Gas-oil carbonized amounted to 56,974 gallons. Residual products made were 12,477 tons of coke, 1160 tons of tar, 571,560 gallons of ammoniacal liquor, and 164 tons of sulphate of ammonia. Most of those products had been sold. The Chairman, in the course of his remarks, said that turning to the accounts they would see that the Directors had spent during the year on maintenance of works, £7352, as against £9770 in the year 1928, or a decrease of £2418. On the maintenance of mains, services, cookers, and meters they spent in 1929, £6767, as against £7923, a decrease of £1155. In depreciation of meters and cookers they had written off the sum of £4000. They received from the sales of residual products £14,726, as against £14,580, an increase of £146. Coke was sold at an average price of £1 2s. 2d. per ton, as against £1 7s. 10d. during 1928, and the total increase in value was £1167. Tar, sulphate of ammonia, and sundries showed a decrease of £1020. On revenue they showed an increase of £4135, chiefly accounted for in the sale of gas and coke. The number of meters in use on Dec. 31, 1928, was 9569, and on Dec. 31, 1929, 10,095; and cookers 7484 and 7767.

ST. AUSTELL.

The Annual Meeting of the shareholders of the St. Austell Gas Company was held on Feb. 24—Mr. S. J. Ingram, the Chairman, presiding. In their report the Directors stated that they were gratified to be able to report a substantial increase in the business of the Company during the year, the sales of gas having increased by over 2½ million c.ft. Forty-eight additional consumers had been connected to the Company's mains. The total number of consumers was now 620 ordinary meters and 1260 slot meters. The credit standing to profit and loss account of £1802 it was recommended should be appropriated as follows: 8½ p.ct. on old shares; 7 p.ct. on new shares; income-tax at 4s.; transferred to reserve fund, £200; carried forward, £644. In moving the adoption of the report, the Chairman said: It is interesting to note the number and type of our consumers—620 served by ordinary meters and 1260 by prepayment meters—a total of 1880, which at our present rate of progress will soon reach 2000. You all know the district we operate in, and when you are told that we supply gas to nearly 2000 houses and premises in our area, you will realize how intimately we enter into the domestic and industrial life of our neighbourhood, and how vital it is to our consumers that nothing should transpire to interfere with the cost and efficiency of our service. If we stopped for a week there would be chaos in the district. While we very gladly welcome new consumers, we are not unmindful of our old ones and do all we can to study their interests, and the records before us show that in this respect we have met with some measure of success. The average consumption of gas per consumer is a constantly increasing one, and last year's figure was a record, with the result that the total sale of gas exceeded by 2½ million c.ft. that of the previous year. Of this increase we estimate half-a-million c.ft. is due to the new consumers and the remaining 2 million c.ft. to increased use of gas by our old consumers.

SHEPPY.

The sales of gas by the Sheppy Gas Company have exceeded those of last year by 9·2 p.ct., and there has been an addition for the year to the number of the Company's consumers of 443, and an increase of 274 in the number of gas stoves sold and let on hire. The Directors have considered it necessary by reason of the continued expansion of the Company's business to increase the gas storage capacity at the works. Extension of mains in the Company's districts for the purpose of meeting the demands of new consumers have been carried out, and further work in this direction is being proceeded with. Interim dividends were paid, *less* income-tax, for the first half-year ended June 30, 1929, of 4 p.ct. per annum on the "A" preference shares, 5 p.ct. per annum on the consolidated ordinary stock; and 6 p.ct. per annum on the 6 p.ct. preference stock; and the Directors now recommend the payment of dividends for the half-year ended Dec. 31, 1929, of 4 p.ct. per annum on the "A" preference shares; 5½ p.ct. per annum on the consolidated ordinary stock; and 6 p.ct. per annum on the preference stock, *less* income-tax. The Directors recommend that the usual donation be given to St. Bartholomew's Hospital, Rochester, and that the usual quantity of coke be distributed among the necessitous during the ensuing winter.

VENTNOR.

The Directors of the Ventnor Gas and Water Company submitted the following statement of accounts for the year ended Dec. 31, 1929. The balance to the credit of profit and loss account (net revenue) to Dec. 31, 1929, is £2511, out of which the Directors recommend the declaration of a dividend of £8 p.ct. on the original capital shares, and £5 12s. p.ct. (*less* income-tax) on the additional capital shares for the year ended Dec. 31, 1929. Negotiations are in progress for a scheme for the amalgamation of the Ventnor Gas Undertaking with that of the Shanklin Gas Company, in pursuance of which it has been arranged to sell the Ventnor Water Undertaking to the Ventnor Urban District Council, and a Purchase Bill will be placed before the shareholders in due course for their approval.

WELLINGTON.

The Annual Meeting of the Wellington Gas Company was held on March 4—Mr. C. W. Leake (Chairman of Directors) presiding. In moving the adoption of the Directors' report and balance-sheet and the payment of a dividend at the rate of 6½ p.ct. on the redeemable preference and ordinary stocks for the half-year ended Dec. 31 last, making with the interim dividend already paid 6½ p.ct. for the year, *less* tax, the Chairman remarked that the profit for the year was £6600, or £4888 more than in 1928. The receipts from gas sold showed an increase of £693, largely due to the very severe weather in February of last year. On the other hand the market price of tar had fallen, and the Company's yield from that source showed a drop of £500. Coke sales, however, had yielded over £400 more than in 1928. The amount standing to the credit of the profit and loss net revenue account was £6373 against £5828 for 1928—an increase of £545. Actually the account stood in a better position than stated, for the sum of £1000 had been reserved for income-tax payable this year. Including £428 transferred from net revenue (representing dividend earned on the standard price and not distributed) the reserve fund balance was now £4933. On the debtor side of the balance-sheet account, the Chairman mentioned that an item of £3126 for amounts due to sundry tradesmen was £1000 higher than for 1928, and that was accounted for by the £1000 reserved for 1930 taxation. On the creditor side coal stock valuation was up by nearly £500. That was due to increased quantities held in stock to meet the Company's needs when it took over the Hadley Company. Mr. R. J. Milbourne seconded.

WOLVERHAMPTON.

The Directors of the Wolverhampton Gas Company presented the following statement of the accounts of the Company for the year ended Dec. 31, 1929. The gross profit for the year is £29,777, out of which has been paid £6544 interest on debenture stock, the net profit being £23,233. An interim half-year's dividend was paid at the following rates—viz., 3 p.ct. on the preference stock; 5½ p.ct. on the consolidated stock; 3½ p.ct. on the new ordinary stock; and the Directors recommend dividends at the same rates for the half-year ended Dec. 31, 1929—all *less* income-tax. The payment of the two half-yearly dividends will absorb £18,174. They also recommend that the balance of £5058 be placed to the reserve fund. Pending any necessary confirmation by the Board of Trade, a sum of £25,000 has been transferred from profit and loss account to a suspense account, to provide for pensions for employees and other payments authorized by section 33 of the Wolverhampton Gas Order, 1924. The sale of gas continues to increase, the extreme severity of the weather in the early part of the year accounting for exceptional increases in the daily output. The residual market, however, is still in a depressed state; but, in spite of this important factor in receipts, the Directors considered it possible to make a reduction in the price of gas at the end of the September quarter. The enlarged and remodelled showrooms were opened by the Mayor of Wolverhampton in July.

WORTHING.

The Annual General Meeting of the Worthing Gas Light and Coke Company was held on March 1—Mr. William Cash, J.P., F.C.A. (the Chairman of Directors), presiding. In moving the adoption of the report and accounts (an extract of which has already appeared in the "JOURNAL"), the Chairman said that in their gas sales for 1929 they had an increase of 11 p.ct., equivalent to an additional 44 million c.ft., compared with an increase of 23½ million c.ft., or 6½ p.ct., in 1928 over 1927. During the past three years the consumption had gone up 90 million c.ft., while during the past ten years it had increased over 100 p.ct., the consumption last year being 436 million c.ft. This was an extraordinary record for any Company. New consumers last year numbered 693, and 1662 appliances, gas stoves, and cookers were sold, compared with 1685 in 1928. This expansion of business followed the growth of the town, there being active building proceeding and a continuous increase in population in all parts outside the immediate centre of the borough. They had also been able substantially to reduce the cost of gas to consumers, the total amount of the reductions for the year being £7721. In spite of these reductions, their receipts were up £2268. Last year they put in two new sets of retorts, raising the capacity of their works to 2,500,000 c.ft. per day. They also overhauled one of their larger gasholders, undertook the renewal of works mains, and enlarged the outlet, which was a difficult and costly operation. With regard to the future policy of the Company, the obvious necessity of preparing for increased manufacture was ever present before the Board, but he could not tell them anything of a definite nature yet in regard to that. Last year they spent £11,024 on capital account for new mains, laying over six miles of new mains. As far as coal was concerned, they were protected by contracts which carried them some way ahead. An extraordinary meeting followed. At this the Chairman explained that the purpose was to give the Directors power to raise a sum of £25,000 of additional capital, by preference stock (not exceeding 7 p.ct. interest), or by consolidated ordinary stock, at such time and in such manner as they might determine, and also to raise not exceeding £12,500 of loan capital, at a rate of not more than 7 p.ct. interest. He said it was quite obvious that if they were going on spending money in the way they were doing they must have additional powers.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Mar. 21.	Rise or Fall on Week.	Transactions Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 6	5	5	Aldershot 5 p.c. max. C.	73–78	..	..
522,992	,,	,,	4	4	Do. 4 p.c. Pref.	70–73	..	..
1,551,868	,,	Sept. 26	7⅜	7⅜	Alliance & Dublin Ord.	93–96	..	96½
374,000	,,	Jan. 9	4	4	Do. 4 p.c. Deb.	60–63	..	..
522,655	,,	Mar. 6	7	7	Barnet Ord. 7 p.c.	109–112	..	..
300,000	1	Oct. 24	1/4½	1/4½	Bombay, Ltd.	16/– 18/–	..	16/3–16/9
174,500	10	Mar. 6	9	9	Bournemouth 5 p.c.	13–14	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	12½–12⅝	..	12⅝
439,160	10	,,	6	6	Do. Pref. 6 p.c.	10½–11½	..	11½
50,000	Stk.	Dec. 19	3	3	Do. 3 p.c. Deb.	53–56	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	72–75	..	..
357,900	,,	Mar. 20	7½	7½	Brighton & Hove 6 p.c. Con.	111–114*	–2	115
871,880	,,	,,	6¾	6¾	Do. 5 p.c. Con.	98–101*	–2	..
1,287,500	,,	Feb. 20	5	5	Bristol 5 p.c. max.	86½–87½a	..	..
855,000	,,	Sept. 12	7½	7	British Ord.	112–117	..	..
100,000	,,	Dec 19	7	7	De. 7 p.c. Pref.	109–114	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	69–71	..	..
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	92–95	..	..
100,000	,,	Jan. 9	5	5	Cambridge 5 p.c. Deb.	90–93	..	..
100,000	10	Dec. 5	8	6	Cape Town, Ltd.	8½–9½	..	..
100,000	10	Nov. 7	4½	4½	Do. 4½ p.c. Pref.	6½–7½	..	..
150,000	Stk.	Dec. 19	4½	4½	Do. 4½ p.c. Deb.	69–74	..	..
626,860	,,	Feb. 20	6	6	Cardiff Con. Ord.	96–99	..	..
237,860	,,	Jan. 9	7½	7½	Do. 7½ p.c. Red. Deb.	98–101	..	..
157,150	,,	Feb. 20	5	6½	Chester 5 p.c. Ord.	87½–92½b	..	..
98,936	1	Oct. 10	†2/-	†2/-	Colombo, Ltd. Ord.	34/–36/–	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	19/–21/-	..	..
375,402	1	Oct. 10	1/9½	1/9½	Colonial Gas Assn. Ld. Ord	20/6–22/6	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/–22/-	..	..
2,073,280	Stk.	Feb. 20	5	7	Commercial Ord.	87–92	..	88¼
475,000	,,	Dec. 19	3	3	Do. 3 p.c. Deb.	57–60	+3	..
787,560	,,	Feb. 20	7	7	Croydon sliding scale.	103–106	+1	103–105
453,100	,,	,,	5	5	Do. max. div.	81–84	+1	80–83
542,270	,,	Mar. 6	7	10	Derby Con.	115–125e	..	..
55,000	,,	Dec. 19	4	4	Do. Deb.	67–70e	..	..
209,000	,,	Mar. 6	5	5	East Hull Ord. 5 p.c.	71–73	..	..
1,002,180	10	Mar. 20	†4	†7	European, Ltd.	12–13*	–¼	12⅝–13
18,629,125	Stk.	Feb. 20	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	17/10½–18/4½f	+·/6	17/6–18/6
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	62–64	+1	62½–63¼
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76–79	+1	76½–77⅞
5,602,620	,,	Dec. 19	3	3	Do. 3 p.c. Con. Deb.	57–60	+1	58–60
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	97–100	..	99½–99⅝
82,500	,,	Mar. 20	7	7	Hastings & St. L. 5 p.c. Conv.	96–101*	–2	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	78–83*	..	..
70,600	10	Oct. 10	†10	†10	Hongkong & Chi na, Ltd.	13½–14½	..	..
213,200	Stk.	Mar. 6	6	6	Hornsey Con. 3½ p.c.	90–93	..	..
1,976,000	,,	Nov. 1	20	10	Imperial Continental Cap.	345–365	..	345–358½
223,130	,,	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb.	70–75	..	73–75
235,242	,,	Mar. 20	8½	8½	Lea Bridge 5 p.c. Ord.	112–115*	–3	..
2,145,907	,,	Feb. 20	6	6	Liverpool 5 p.c. Ord.	88½–89½b	..	..
600,000	,,	Mar. 20	7	7	Do. 7 p.c. Red. Pref.	97⅝–99⅝b*	–2⅜	..
165,736	,,	Feb. 20	9	8	Maidstone 5 p.c. Cap.	119–124	..	..
63,480	,,	Dec. 19	3	3	Do. 3 p.c. Deb.	52–55	..	..
75,000	5	Dec. 5	†10	†10	Malta & Mediterranean	5½–6	..	..
392,000	—	Oct. 1	5½	5½	Metrop'itan (of Melbourne) 5½ p.c. Red. Deb.	92–95	..	..
541,920	Stk.	Nov. 21	†9	†6	Montevideo, Ltd.	107–112	..	109½–110½
2,061,315	,,	Feb. 20	5	5½	Newcastle & Gateshead Con.	15/9–16/3d/f	..	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref.	69½–70½d	..	..
691,705	,,	Dec. 19	3½	3½	Do. 3½ p.c. Deb.	66½–67½d	..	..
169,940	,,	Mar. 6	7½	7½	North Middlesex 6 p.c. Con.	109–114	..	..
396,160	,,	Feb. 6	5	5	Northampton 5 p.c. max.	74–77	..	..
300,000	,,	Nov. 21	7	9	Oriental, Ltd.	108–113	..	..
60,000	£5	13 My., '15	—	—	Ottoman	0–¼	..	..
205,162	Stk	Jan. 9	8	8	Plym'th & Stonehouse 5 p.c.	107–110	..	..
424,416	,,	Feb. 20	8	8	Portsm'th Con. Stk. 4 p.c. Std	110–115	..	113–113½
241,446	,,	,,	5	5	Do. 5 p.c. max.	78–81	..	81
2,334,464	1	June 27	—	‡5	Primitiva Ord.	27/–29/-	..	..
244,500	100	Dec. 2	4	4	Do. 4 p.c. Red. Deb.	92–95	..	..
695,000	Stk.	Jan. 23	4	4	Do. 4 p.c. Red. Deb. 1911	77–80	..	..
416,345	,,	Dec. 19	4	4	Do. 4 p.c. Cons. Deb.	77–80	..	..
150,000	10	Sept. 26	6	6	San Paulo 6 p.c. Pref.	8½–9½	..	..
1,796,968	Stk.	Mar. 20	6¼	6¼	Sheffield Cons.	103–104e*	–2½	..
95,000	,,	Jan. 9	4	4	Do. 4 p.c. Deb.	76–78e	..	..
90,000	10	June 13	‡4	‡4	South African	4–6	..	..
6,700,895	Stk.	Feb. 20	5	7½	South Met. Ord.	97–99	..	97½–99
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	107–110	+1½	108⅝
1,895,445	,,	Jan. 9	3	3	Do. 3 p.c. Deb.	56–59	+1	56⅜–59
734,000	,,	Mar. 6	6¼	6¼	Do. 6½ p.c. Red. Db.	97–99	..	98½
91,500	,,	Mar. 20	8½	8½	South Shields Con.	105¾–107¼d*	–3½	..
1,543,736	,,	Feb. 20	6½	6½	South Suburban Ord. 5 p.c.	98–101	..	98–99
468,837	,,	Dec. 19	5	5	Do. 5 p.c. Deb.	92–95	..	93¾–94½
647,740	,,	Feb. 20	5	5	Southampton Ord. 5 p.c. max.	76–79	+1	78
121,275	,,	Dec. 19	4	4	Do. 4 p.c. Deb.	72–75	+3	..
179,014	,,	Feb. 20	8	8	Sutton Ord.	113–116	..	..
67,828	,,	Jan. 9	5	5	Do. 5 p.c. Deb.	91–94	..	..
250,000	,,	Mar. 6	7	7	Swansea 7 p.c. Red. Pref.	97–99	..	..
200,000	,,	Dec. 19	6¼	6¼	Do. 6¼ p.c. Red. Deb.	99–101	..	..
1,076,490	,,	Mar. 6	6¼	6¼	Tottenham District Ord.	100–104	+1	101½
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	95–98	..	..
199,035	,,	Dec. 5	4	4	Do. 4 p.c. Deb.	70–73	..	..
182,580	10	30 Dec., '12	—	—	Tuscan, Ltd.	3⅜–4⅜	..	..
85,701	Stk.	Mar. 20	6	6	Do. 6 p.c. Red. Deb.	75–80*	..	..
309,094	,,	Mar. 6	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	94–99	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	88–88	..	..
1,180,910	,,	—	—	—	Wandsworth, Wimbledon, and Epsom Cons.	107–112	..	107
200,000	,,	Feb. 20	5	5	Do. 5 p.c. Pref.	85–90	..	..
488,344	,,	Dec. 19	5	5	Do. 5 p.c. Deb.	92–97	+1½	96½

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. f.—The quotation is per £1 of Stock. *Ex. div. †Paid free of income-tax. ‡For year.

Governor-General

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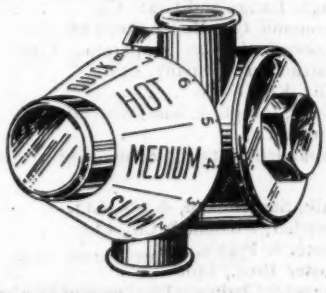

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Gunde Bridge, Manchester.

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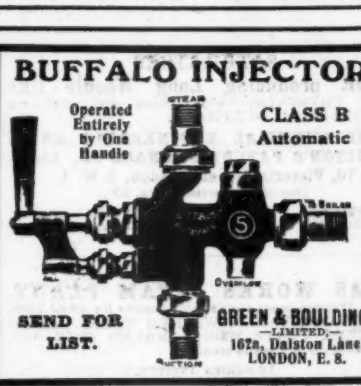

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